SPECIAL TELEPHONE SUPPLEMENT—Berliner Decision in Full.

ILLUSTRATED ELECTRICAL REVIEW

A Journal of Scientific and Electrical Progress.

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VIEWS, NEWS AND INTERVIEWS.

What a whopper! The Syracuse *News*, in quoting Vice-President Hawley about the Niagara Falls plant, says the tunnel used is 8,000 feet in diameter. Quite a respectable hole in the earth.

Here it is again. A California inventor has discovered an electrolyte for battery purposes which does the business. Of course, he proposes to do away with dynamos, and is only waiting till he reduces the cost of making the fluid used in his battery. *O tempora, O mores!*

Teheran, Persia, is to have a telephone exchange, and a New York house is to supply the instruments. They will have to be carried 800 miles on the backs of mules to get to their destination after landing at Bushire. We think there is an opening here not only for a telephone exchange but for a trolley line.

The fire commission in Detroit is having a hard time in trying to arrange contract for telephones. The old and new company each wants the contract for engine-houses, and injunction proceedings have been begun.

New Form of Insulating Joint.

A new insulating joint for interior wiring has recently been perfected by Stanley G. Flagg & Company, Hamilton and Nineteenth streets, Philadelphia, which has several points of desirability likely to bring it into general use.

The joint for the combination electric and gas fixture is claimed to be of such construction that under all conditions it is perfectly insulated, preventing accidents caused by the electric wires or taps coming in contact with the gas pipe, and with what is known as the "grounded part of the joint". This dispenses with unnecessary tubes or tubing, which at present are required to be placed over the electric wires or taps extending from the wall or ceiling surface below the grounded part of the joint, and requiring an extra large canopy or shell to conceal the same, which makes an unsightly, bulky appearance, and greatly detracts from the beauty of the fixture.

This joint is capable of withstanding such strains as would be necessary in straightening the fixture after it is hung in position, without danger of causing a leakage of gas or injuring the insulated part.

The joint for electric fixtures is constructed so that when it is taken apart the electric wires or mains in the electrolier may be brought through the bottom part of it. The screws which connect the upper and lower section are so placed that the joint may be connected and disconnected after the fixture is in position, whether a plain or telescoped canopy is used, and an electrolier may be easily adjusted to an outlet in a corner or in an inconvenient place. This joint can be operated in rear of canopy, and can be connected to an outlet without turning the fixture. A feature also is that it may be used in bulk windows without requiring the fixture to be built up, and the mica surfaces renders them perfect in insulation.

These joints have been approved by the National Board of Fire Underwriters.

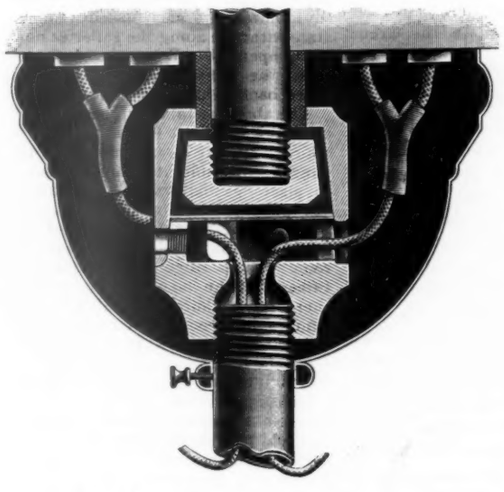


Fig. 1.—The Flagg Joint Wiring for Electric Fixture.

Fig. 2.—The Flagg Joint, Electric Joint Detached.

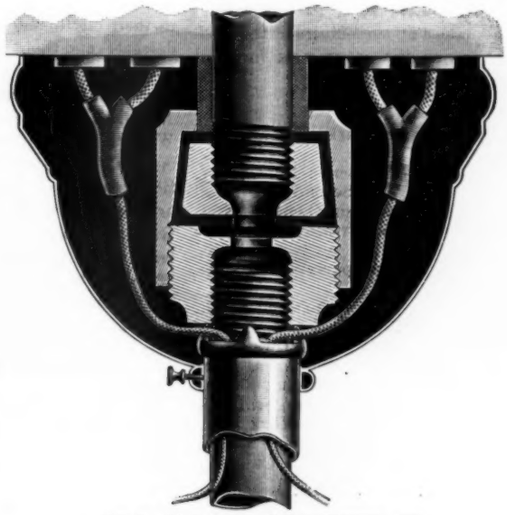


Fig. 3.—The Flagg Joint Wiring for Combination Fixture.

Suit About an Incandescent Lamp Patent.

Suit has been begun in the United States Circuit Court in Trenton by the Westinghouse Electric and Manufacturing Company, of Pittsburgh, against the Beacon Lamp Company, of New Brunswick, N. J. It is claimed that the latter is using a method of carbonizing filaments for incandescent electric lamps which was invented by Edward P. Thompson, of Elizabeth, and transferred to the Westinghouse company.

THE ELECTRIC LIGHT CONVENTION.

Particularly Valuable Programme Announced.

THE TWENTIETH CONVENTION OF THE NATIONAL ELECTRIC LIGHT ASSOCIATION AT NIAGARA FALLS, N. Y., TO BE HELD UNDER MOST FAVORABLE CIRCUMSTANCES—CALLED FOR JUNE 8, 9 AND 10—AN UNUSUALLY LARGE ATTENDANCE ALREADY ASSURED—SPECIAL TRAINS FROM NEW YORK AND CHICAGO.

The last convention of the National Electric Light Association was held one year ago this month in the city of New York, and, while a very instructive and interesting meeting, its proceedings were overshadowed by the Electrical Exposition, then running in the Grand Central Palace, New York, where the sessions were held. One year and one month later the next convention will meet, and the sudden and unexpected demand for hotel accommodations at Niagara

Falls, N. Y., where it is to convene, has at once appalled and delighted the hotel proprietors of that growing city, and almost paralyzed the vigilant Secretary Porter of the association, who has undertaken to assist in seeing that members secure the rooms desired. Two hotels, the International and the Cataract, are reported to be ordering a fresh supply of hall cots, and other Niagara Falls hostelries are being filled up with the overflow. Still, everybody will find accommodations, for M. o. T. C. O. Baker, Jr., stands ready to turn Charley West Shore Lambert's parlor cars, of the special New York train, into sleeping apartments if they are needed by the wandering electric light men. So it will not be at all necessary to stay away, and, from appearances, no one at all interested will.

The large attendance is explained by one member, who says that this is the first convention since the beginning of the improvement in the electrical business, and the gentlemen interested all wish to get together and compare notes and head off any sudden boom, but all work in line for a continued and swelling prosperity.

The programme that has had the fathering care of President Nicholls and Secretary Porter has just been issued, and is a very attractive and elegantly printed pamphlet, illustrated with several views of Niagara Falls and describing numerous points of interest to the electrical visitors. The names of the officers of the association and the programme in detail are printed below:

OFFICERS:

President: Frederic Nicholls, Toronto, Ont.

First Vice-President: Henry Clay, Philadelphia, Pa. Second Vice-President: J. J. Burleigh, Camden, N. J.

Secretary and Treasurer: George F. Porter.

Master of Transportation: C. O. Baker, Jr.

Executive Committee: Charles R. Huntley, Buffalo, N. Y.; A. Markle, Hazleton, Pa.; W. W. Carnes, Memphis, Tenn.; W. R. Gardener, Pittsfield, Mass.; G. A. Redman, Rochester, N. Y.; H. A. Wagner, St. Louis; Mo.; John A. Seely, New York, N.Y., A. J. De Camp, Philadelphia, Pa.; A. M. Young, Waterbury, Ct.

PROGRAMME:

TUESDAY, JUNE 8, 1897.
Meeting of the Executive Committee, at 9 A. M., Secretary's Office, International Hotel.
Morning Session, 10.30 o'clock, Convention Hall, International Hotel.
Address, President, Frederic Nicholls.
Report, Committee on Standard Candle-Power of Incandescent Lamps, Louis Bell, Chairman.
Report, Committee on Data, H. M. Swetland, Chairman.
Report, Committee on Rules for Safe Wiring, William Brophy, Chairman.
Afternoon Session, 2 o'clock.
Report, Committee on Finance, John A. Seely, Chairman.
Paper, J. B. Cahoon, Elmira, N. Y.
"Standardizing Prices for Incandescent Light and Power."
Topic, "Theft of Current and How To Deal With It."
Paper, W. Worth Bean, St. Joseph, Mich.
"Municipal Lighting."
Questions and Answers? What Is It You Wish To Know?
Executive Session.
WEDNESDAY, JUNE 9, 1897.
Morning Session, 10 o'clock.
Paper, C. L. Edgar, Boston, Mass., "Correct Method of Charging for Product."
Paper, J. G. White, New York, N. Y., "The Niagara Power Transmission Line."
Paper, Arthur Wright, Brighton, England, "Profitable Extensions of Electricity Supply Stations."
Topic, "Commercial Results with Inclosed Arcs."
Afternoon Session, 2:30 o'clock.
Paper, Professor Chas. A. Carus-Wilson, McGill University, Montreal, Can. "The Induction Factor, a New Basis of Dynamo Calculation and Classification."
Paper, Professor Elihu Thomson, Lynn, Mass., "Recent Progress in Arc Lighting."
Paper, T. C. Martin, New York, N. Y. "The Daylight Work of Central Stations."
Questions and Answers? What Is It You Wish To Know?
Executive Session.
Evening Session, 8 o'clock.
Lyceum Theater,
Paper, L. B. Stillwell, Niagara Falls, N. Y., "Niagara Power." (Illustrated with Stereopticon.)
THURSDAY, JUNE 10TH, 1897.
Morning Session, 10 o'clock.
Paper, B. F. Lamme, Pittsburgh, Pa., "Polyphase Motors."
Topic, "Best Efficiency for Incandescent Lamps."
Paper, Lieut. F. Jarvis Patten, New York, N. Y., "Frequency Transformation."
Topic, "Are the Large Arc Lighters Commercially Desirable?"
Afternoon Session, 2.30 o'clock.
Topic, "Lamp Carriers Other Than Ordinary Posts."
Paper, C. F. Scott, Pittsburgh, Pa. "Rotaries for Transforming Alternating into Direct Current."
Executive Session.
Reports.
Secretary and Treasurer, Executive Committee.
Election of Officers.

Arrangements have been made with the Trunk Line Association, Central Passenger Association, New England Passenger Association and Southern Passenger Association for a rate of fare and one-third, on certificate plan, for round trip from all points in their territory to Niagara Falls for delegates and their friends. A special train of vestibuled parlor, library and dining cars will leave New York on Monday, June 7, at 10.15 A. M., via West Shore Railroad, arriving at Niagara Falls at 10.15 P. M. Return tickets good via West Shore Railroad or New York Central & Hudson River Railroad. For seats on this train, apply to Mr. C. O. Baker, Jr., 136 Liberty street, New York city. Going tickets, including parlor-car seat, $10. A special from Chicago is also planned.

The headquarters and convention hall will be at the International Hotel, and this house, together with the Cataract House, will care for delegates and guests at prices ranging from $3 to $5 per day, American plan.

Through Three and One-Half Inches of Safe Steel by Electricity.

TO THE EDITOR OF ELECTRICAL REVIEW:

In Mr. Kammeyer's very interesting article of the 12th instant, where I am quoted in connection with some safe-burglarizing experiments, I am made to say that the thickness of the steel shell was one and one-half inches. This is an error, the thickness being *three and one-half* inches, and, I am quite sure, I so wrote in my statement. Kindly publish this correction and oblige. Yours very truly,

J. K. PUMPELLY.

Chicago, May 15.

Electric Lighting of a Quarry.

An interesting electrical installation has recently been made in the quarries and mills of the F. O. Norton Cement Company at Binnewater, N. Y., situated in the Rosendale cement district, about seven miles from Kingston.

This company manufactures the natural cement as distinguished from the Portland, the bulk of the latter consumed here being imported from Europe. The deposit from which the Norton (natural) cement is made is bluish gray magnesian limestone or cement rock, found in strata of between 14 and 17 feet in thickness, constituting the hills along the valley of the Roundout Creek.

These strata occupy various inclinations to the horizon, the face of the country in this region exhibiting signs of violent volcanic upheavals, some having taken place while the cement was in a plastic form.

The process of manufacture consists in quarrying the stone in the ordinary manner, with powder and dynamite, the latter being considered the safer. The rock is taken out in separate galleries, corresponding with the various strata or layers. There are two such strata in the Norton quarries available for use in the manufacture of a high-grade cement, the upper and the lower layer. These are separated by a middle layer which seems to contain some impurities and can not, therefore, be relied upon for producing a first-class article.

From 120 to 125 tons of cement rock is disengaged at each blast. The average result is about four and one-half barrels of cement to one ton of rock. In the Flint quarry there is being operated, or have been worked out, seven levels, and in the Grant quarry four levels.

The stone as taken from the quarries is broken up into pieces of about a cubic foot each, and laid upon small cars. The cars are then hauled to the kilns, which are cylindrical structures built of stone. These are about 9 feet in diameter and 28 to 30 feet in height, the sides converging at the bottom. In these kilns layers of stone about 6 to 10 inches are placed, each alternating with a layer of pea coal. The stone is then thoroughly burnt to remove the carbonic acid gas, and the calcined product is drawn from the bottom of the kilns twice every 24 hours. After careful inspection the over-burnt and under-burnt stone are separated, and the properly burnt product is wheeled to the cars and carried to the crusher, which reduces it to a suitable size for grinding. From these it passes to the mills immediately underneath, where it is reduced to powder and is conveyed by machinery to another portion of the mills, where it is fed into barrels lined with paper to exclude dampness.

At the quarries about 1,600 barrels of cement are manufactured per day, running 300 pounds to the barrel. The galleries have 50 feet face. The veins are known as the dark vein, 17 feet in thickness, and the light vein, about 14 feet in thickness. The two qualities of stone are mixed in a stone crusher, producing a uniform grade of cement. The galleries are upheld by pillars 20 feet square and 30 feet apart.

The power plant consists of four horizontal steel tubular boilers, 16 feet by 17 feet, furnishing steam at 100 pounds pressure to a 750 horse-power Harris Corliss cross-compound, slow-speed engine. This power is used to operate 16 cracker mills, the crushers, etc., etc.

Twenty kilns of the dimensions mentioned above are now in service.

The electric plant consists of a 30-kilowatt alternating-current incandescent dynamo, manufactured by the General Electric Company, as, in fact, are the lamps and wiring devices of which the plant consists. This machine is driven by a 10 by 12 horizontal automatic Ball engine.

There are now installed 103 incandescent lights, lighting the kilns' shed, where the calcined product is taken to the crushers, the mills, the packing rooms, the shipping rooms and the various other departments of the factory.

The quarries are lighted by 40 incandescent lamps and 14 arc lamps. The current is used at a pressure of 300 volts, being reduced by transformers to the necessary voltage for arc and incandescent lamps. Each arc lamp is operated by its individual transformer; in addition, one or two incandescent lamps on flexible cords, protected by wire cages, will be operated from the same transformer where particularly close light is required.

Arc lamps are also connected by flexible cord to the transformers, which are placed back of the nearest pillar to the face of the gallery. The lamps are supported from the roof of the gallery by means of rope and pulley, and give a most satisfactory general illumination for the whole work. The men have suspended a light for handling the drills and shoveling the broken stone in the loaded cars, etc. Incandescent lights, fixed in position, are placed at the main platforms, turn-table, etc., while lamps for the purpose of general illumination are also placed at moderate intervals along the galleries now being operated. When the blasts are fired, the lamps are unhooked and taken back behind the pillars.

The above installation has entirely done away with oil lamps, the use of which, in many cases, rendered work almost impossible, it being necessary to place the drills at the very top of the gallery, on a shelf sufficiently below the roof for the erection of the drill. In the days of oil lamps the room was so filled with smoke and fumes that the men could only work there for a short time; in fact, the whole mine was rendered murky and disagreeable to work in by the odor from the lamps.

The circuits are carried into the quarries from the power-house, a distance of about 400 feet in one direction and 1,500 feet in the other. They are carried along the galleries, fastened to insulators fixed to plugs driven into holes in the roof of the worked-out galleries. From various points main loops are carried to the galleries, where the work is going on.

In conversation with the manager and engineer, we learn that no considerable difference can be detected in the amount of coal used since the introduction of electricity, and they are fully satisfied that it costs no more than they were obliged to pay each month for oil under the old method. They are equally certain that the amount of work which can be done by means of electric illumination is greater, while far more easily performed. The present electric plant is only working to about one-half its capacity, and lights will be added as the work is extended.

The Pope Manufacturing Company's Columbia Motor Carriages.

After three years' experimenting and development this company has finally settled down to a carriage driven by an electric motor and storage battery as the most practicable, though all other automobile devices were thoroughly tested. Everything about the carriage is made on a bicycle basis and ball-bearings are freely used throughout.

The frame is made of the Pope Tube Company's well known .50 carbon steel, and selected in dimensions that enable it to be used in the annealed state. As a result a better alignment of bearings can be insured. The radius of action of the carriage is something over 30 miles. The speeds are maximum 15, third speed 12, second 6, and first 3 miles an hour on smooth level roads.

FIG. 1.—COLUMBIA MOTOR CARRIAGE—FRONT VIEW.

The batteries can be charged from any 110-volt continuous current, which is the most common circuit in general use in the cities of this country as well as in the plants of manufacturers and those of private individuals. In short, it is the most available of currents. The cost of operating at the usual charges for current in the various cities would be about one and one-quarter cents per mile. From one's own electric apparatus the carriage could be charged for not over one-half cent per mile. The carriages have a meter or indicator showing the extent to which the batteries are exhausted.

It will be seen from this that upon a probable average run of 20 miles a day, the expense of operation of these carriages would vary according to the conditions above cited, from 10 cents a day to 25 cents a day. The difference between the annual expenditure on this basis, and the cost of keeping the two horses, which would be necessary to maintain the same service, certainly represents the interest on many times a greater sum than the difference between $3,000, the price of each of these carriages, and the cost of any carriage which could take its place, or, for that matter, of the entire price.

In charging the batteries the connection is so made that one wholly ignorant of electric matters can make no mistake in the connection, and when the batteries are fully charged they will automatically cut themselves out. The batteries used are those manufactured by the Electric Storage Battery Company, of Philadelphia.

Everything is constructed on a basis for the roughest kind of service, even though finished for the finest. The carriages are entirely available in the most severe weather, and while their radius of action is, of course, necessarily reduced, six or eight inches of heavy snow is no obvious obstacle, and the same is proved to be true of mud. These statements are not a matter of surmise, but the result of actual daily use without restriction of the preliminary carriage constructed by the Pope company, which has now made a record of about 3,500 miles, and has never sustained an accident so severe as to prevent its return with its own power. Incidentally, the endurance of the batteries was well demonstrated by this experience, and, although they were carefully examined a few days ago, they show no signs of deterioration.

The carriage, as shown by the illustrations, is much like a Stanhope phaeton, and weighs complete about 1,700 pounds. It is now being manufactured by the Pope Manufacturing Company at its Hartford works.

Accident to Treasurer S. S. Sias.

Mr. S. S. Sias, treasurer of the Boston Electric Light Company, is suffering from a broken arm. Last week, with the president of his company, Mr. Fred. A. Gilbert, and five others, Mr. Sias was enjoying a coach ride in the mountains, when the coach upset and all were thrown out. The president, as he probably deemed it his right, landed on top of the treasurer. The president weighs nearly 300 pounds! Mr. Sias, it is thought, will suffer nothing further than the discomfort of having to carry his left arm in a sling for several weeks, and his numerous friends will greatly regret that he suffers that much, but will extend congratulations that his injuries, under the circumstances—and the president—were no worse. Every member of the party was more or less bruised except Mr. Gilbert, who, as before stated, selected the place on which to fall in accordance with his official rights, and, consequently, was the only one unhurt out of seven.

The New York & New Jersey Telephone Company.

This ably-managed company is to erect at once a large building, costing $300,000, on the corner of Willoughby and Lawrence streets, Brooklyn. Mr. R. L. Daus is the architect, a gentleman of conspicuous ability in his profession. The building will be eight stories and basement, steel-frame construction, on massive concrete foundations. Floors will be partly fireproof, flat arches between beams, and partly Columbian fireproofing. Dark blue Indiana limestone and gray and terra-cotta brick will be the facing material. The style will be Italian Renaissance, and no doubt the building will be a credit to Greater New York. The plumbing, heating and ventilation are completely worked out, the air being discharged above the roof. Everything is calculated particularly to serve the wants and promote the health and safety of the occupants.

The company, organized in 1883, was five years in Fulton street, since then being located on Smith street. Its charter covers Long Island, Staten Island and the northern half of New Jersey. It had, in 1883, 2,339 subscribers and 30 central offices. It has now over 16,000 subscribers, 86 central offices and 21,642 miles of wire, 16,779 of which are underground and 4,863 aerial.

In 1884, a year before the subway laws were passed, it begun the work of putting its wires under ground. The last report of the Subway Commission, October 31, 1896, showed that the telephone company in Brooklyn had 11,655 miles laid under ground. The mechanical operations of the company are in charge of J. C. Reilly, general superintendent, and F. W. Conn, assistant superintendent in charge of the Long Island construction.

The officers of the company are: President, Charles F. Cutler; vice-president and general manager, W. D. Sargent; secretary, Joel C. Clark; treasurer, Henry Sanger Snow; executive committee, Charles F. Cutler, Joseph P. Davis, W. D. Sargent, Joel C. Clark; directors, Charles F. Cutler, Alexander Cameron, Joseph P. Davis, Charles A. Nichols, Hugh Kinnard, William D. Sargent, David B. Powell, George H. Prentiss, Joel C. Clark, Felix Campbell, Edward J. Hall, Henry Sanger Snow.

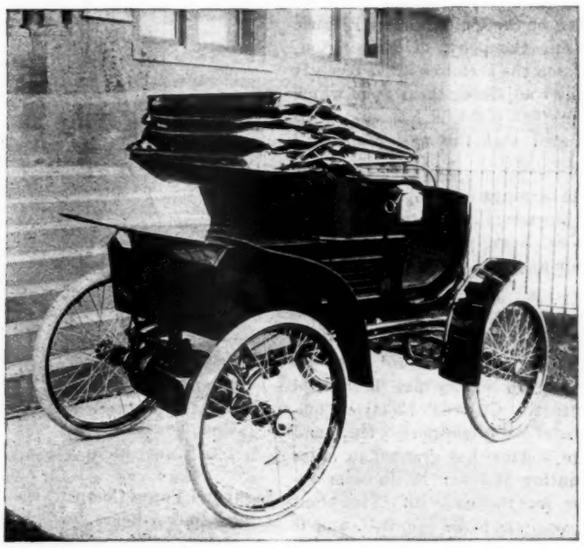


FIG. 2.—COLUMBIA MOTOR CARRIAGE—REAR AND SIDE VIEW.

ELECTRIC RAILWAY NOTES.

It is reported that the electric railroads of Boston, Mass., carried in 1896 166,000,600 paying passengers and gave 18,000,000 free transfers. The total distance run by all the cars each day is estimated at about 66,000 miles.

The South Jersey Traction Company, of Bridgeton, N. J., which was sold out recently at master's sale, has been reorganized as the Bridgeton and Millville Traction Company, with the following officers: Directors—C. Hartman Kuhn, Stephen Greene, Aaron Fries, Bloomfield H. Minch, Lawrence Johnson, Frank S. Lewis and Walter H. Bacon. C. Hartman Kuhn was elected president; Stephen Greene, vice-president, and Walter H. Bacon, secretary and treasurer.

A plan to connect Montreal with near-by points across the river is being talked of. The road will probably be called the Montreal & Southern Counties Railway. The idea is to connect Montreal and the south shore with the counties of Chambly, Vercheres, Ronville, St. Hyacinthe, Laprairie, Brown, Shefford, Stanstead and Sherbrooke. From Montreal to Sherbrooke the main line and branches will form a system of 150 miles of track, and the road is to be constructed on the most approved methods. The trucks will be built in such a way that the cars can be run as fast as 40 miles an hour.

The Florence & Cripple Creek Railway Company, Colo., are considering the question of disposing of their steam locomotives and substituting lighter but much more powerful electric motors in their stead. The grades are so heavy on the lines leading to Cripple Creek that much of the power of the steam locomotives is wasted in lifting their own weight. While the best are only able to trail five cars behind them, electric motors of double the power, that are not encumbered with coal and water, are available, and it is proposed to use them. The same company also expects to be the first in to the Cripple Creek camp with electric power for sale.

ELECTRIC LIGHT FLASHES.

The Las Vegas, N. M., Electric Light Company has brought a suit against the county for $1,496.57.

The electric plant of the Somerset Lighting Company, through an agreement with J. B. Duke and the Raritan Water Power Company, will be removed to Raritan, N. J. The new station is in course of erection.

The electric light plant and the waterworks, of Glasgow, Ky., were destroyed by fire, at a loss of $19,000, with $15,000 insurance. The waterworks plant, valued at $15,000, was a total loss, with no insurance. Fire probably of incendiary origin.

The United States Electric Light Company, of Washington, D. C., has negotiated the sale of $300,000 of bonds for the extension of their plant. Contracts have been entered into with the General Electric Company for electrical apparatus to the amount of $73,000.

A central power station and electric lighting plant will soon be erected by the United States Electric Lighting Company, of Washington, D. C., on the premises it has recently acquired adjoining those upon which the present plant is located. It is estimated that the new plant will cost $300,000.

The earnings for April of the Edison Electric Illuminating Company of New York, including the high-tension systems, were as follows:

	1897.	1896.	Increase.
Gross.....	$206,142 93	$180,110 64	$26,032 29
Net.....	100,844 50	80,581 30	20,260 20
Gross, four months..	867,116 41	777,670 05	89,446 36
Net, four months..	425,814 56	359,368 68	66,445 88

A bill in equity has been filed against the Citizens' Electric Company, of Williamsport, Pa., and Judge Metzger has granted an order appointing William E. Ransom receiver for the concern. The plant will continue to be operated, and it is expected that matters will be adjusted in a short time.

H. L. Driver & Company have filed a second attachment suit against the Salt Lake & Ogden, Utah, Gas and Electric Light Company. In this action judgment is demanded for $4,567.68 on two causes of action for gas alleged to have been sold and delivered, and several additional levies will be made under the writ of attachment.

At the annual meeting of the Mechanic Falls, Me., Electric Light and Power Company the following officers were chosen for the ensuing year: S. S. Waterhouse, president; H. C. Rowell, vice-president; L. A. Moulton, treasurer; H. T. Sands, clerk. Directors: S. S. Waterhouse, H. C. Rowell, L. A. Moulton, Judge Percival Bonney, A. E. Sawyer.

The Flushing, L. I., Electric Light and Power Company is erecting a new power house on Lawrence street, which, when completed, will cost about $60,000. The company has obtained the franchises for supplying the villages of College Point and Whitestone with light, and it was found necessary to enlarge the plant to meet the increased demand.

The Dolgeville, N. Y., Electric Light and Power Company has let a contract to harness the High Falls to the Stillwell-Bierce & Smith-Vaile Company, of Dayton, Ohio, at a cost of about $70,000. The contract provides that the work, including power house, placing of water-wheels, as well as the raceways, must be completed by September 15, 1897. The work will begin at once.

The annual report of the Electric Storage Battery Company, of Philadelphia, makes the following showing:

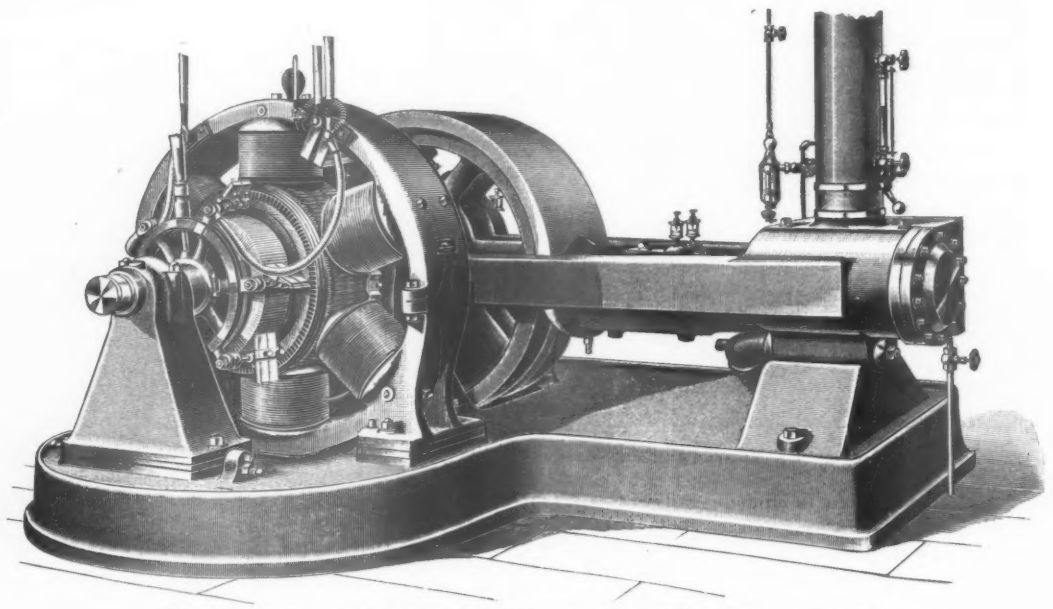
	1896.	1895.
Gross sales.....	$646,319	$328,231
Manufacturing cost.....	362,142	247,938
Office and legal expenses, commissions, taxes and interest...	142,178	70,529
Net profit.....	$141,999	$ 9,764
Royalty and investments.....	6,801	2,218
Total net income.....	$148,800	$ 11,982
Interest on bonds.....	13,738	abt. 9,000
Balance, surplus.....	$135,063	$ 2,982

The Flushing, N. Y., Electric Light and Power Company is erecting a new power-house, which, when completed, will cost about $60,000. The company has obtained the franchises for supplying the villages of College Point and Whitestone with light, and it was found necessary to enlarge the plant to meet the increased demand. It is expected that these villages will be supplied with electric lights within another month.

Gerard Bennett and Herbert D. Levine, contractors, have brought suit in the Supreme Court to recover $11,520 from the Edison Illuminating Company, of Brooklyn, N. Y., for the construction of three wells to supply the illuminating station, 81 Gwinett street. They claim that they were to be paid $10 for every 1,000 gallons of water furnished per day. The company refuses to pay on the ground that the amount charged is excessive. Testimony is being taken before Justice Keogh.

At the annual meeting of the stockholders of the Manhattan Electric Light Company, of New York city, the following board of directors was unanimously elected: R. R. Bowker, Frank Enos, C. S. Shepard, E. A. Leslie and H. M. Edwards. The election of directors of the Harlem Lighting Company followed in the same offices, and resulted as follows: Frank Enos, E. A. Leslie, John W. Leib, Jr., Joseph Williams, H. M. Edwards, C. S. Shepard and Henry Stevenson. Both boards will meet in a few days and elect officers.

The Greeley, Colo., Electric Light Company has been sold under a deed of trust for $5,000, the indebtedness against the company being $17,250. A new company will immediately be organized under the name of the Greeley Power and Light Company, with a capital stock of $17,000, with the following directors: William Mayher, James Tuckerman, representing the Currier estate; H. C. Watson, for the Greeley National Bank; J. S. Gale for the Union Bank, and M. Boomer. They propose to thoroughly overhaul the plant and put it in first-class order.



MODERN DESIGN OF "STRAIGHT LINE" ENGINE, DIRECT-CONNECTED TO DYNAMO.

The Packard Lamp.

We are in receipt of a report on the Packard lamps by Superintendent Winn, of the meter and lamp department of the Cincinnati Gaslight and Coke Company, which shows the Packard product in a very favorable light indeed. As the data contained are, besides, useful, we give the tabulation:

TEST OF PACKARD LAMPS. SIX LAMPS, MARKED 16 CANDLE-POWER, 104 VOLTS. AVERAGE MEASUREMENTS.

Hours.	Volts.	Amperes.	Total Watts.	Candle-Power.	Watts per Candle-Power.
Initial.....	104	0.54	56.78	16.14	3.51
End of 50 hrs	"	0.55	57.04	16.31	3.44
" 100 "	"	0.52	54.60	16.43	3 26
" 150 "	"	0.53	60.32	16.40	3.67
" 200 "	"	0.54	56.84	16.37	3.47
" 250 "	"	0.54	56.80	16.37	3.46
" 300 "	"	0.57	60.27	17.10	3.52
" 350 "	"	0.57	59.49	17.00	3.14
" 400 "	"	0.57	59.62	16.16	3.68
" 450 "	"	0.55	57.41	16.10	3.50
" 500 "	"	0.53	55.61	15.62	3.56

Test unfinished.

A verdict against the Nassau Electric Railroad Company, in the sum of $16,875, was rendered a few days ago in the Supreme Court in Brooklyn, in the suit of Andrea Vollkommen, 14 years old, who lost his right leg on December 9, 1896, at Marcy avenue and Wolcott street.

"Straight Line" Engine.

The illustration herewith shows one of the newest designs of the "Straight Line" engine connected to a General Electric Company's dynamo. The arrangement for connections between the engine and dynamo differs from others in having a safety coupling between the two. A flange is forged on the dynamo shaft, a cone is keyed and pinned on the engine shaft, and a solid bush is bolted to the flange and drawn on the cone so as to create driving friction enough to run dynamo, but not so much as to burn out the dynamo in case of a short circuit. By this arrangement either dynamo or engine can be dismantled without disturbing the other. Aside from the adjustable outboard pedestal, the base, pedestals and dynamo supports are cast in one piece, where it can be placed if in one piece, and the whole arranged to be filled with masonry before setting on foundation.

LITERARY.

The only flying machine that has ever actually flown—that is, maintained and moved itself in the air by energy generated in its own mechanism—is one lately constructed, after years of laborious and disappointing experiment, by Prof. S. P. Langley, secretary of the Smithsonian Institution. The first full and the only authoritative account of this epoch-making invention will appear in *McClure's Magazine* for June, in a paper written by Professor Langley himself, and illustrated with diagrams and pictures made under his direction. This is probably the most important magazine paper ever published in this country.

The Manufacturers' Club, of Philadelphia, will celebrate the tenth anniversary of its organization by joining with the Philadelphia Commercial Museum in making a success of the first annual meeting of the International Congress of business men, to be held in that city June 1, 2 and 3. *The Manufacturer*, in rounding out its tenth year, will celebrate the event by issuing a large special edition on the occasion of this great meeting. It has been selected to give an accurate and official report of the proceedings, in addition to much valuable information bearing on the business interests of the country, and specially refer to South American trade.

The New Walker Arc Lamps.

Most of the details in connection with the various forms of arc lamps, which the Walker Company will make, have been completed in the factory at Cleveland, and the earliest to be offered to the market is the out-door design, shown in illustration, Fig. 1. This lamp is only 34¼ inches long; when newly trimmed the carbon is 26 inches, and so making the lamp only eight and one-quarter inches longer than the carbons. The carbons are in direct connection with the point of supply by means of flexible cables, and mounted on the same spindle that carries the clutch wheel is a sprocket wheel, as shown in Fig. 2, driven by a chain, which also feeds both carbons, while the arc remains practically stationary. In place of the usual cumbersome rod is a wheel of small diameter with an accurately turned rim, on the edge of which the clutch operates.

FIG. 1.—OUT-DOOR TYPE, NEW WALKER ARC LAMP.

The electro-magnetic mechanism is simply a mechanically differential mechanism, that is, the series bobbin and the shunt bobbin are separate and pull in opposite directions on the same armature.

The electro-magnet is shown in diagram in Fig. 3. The armature is cleft at its extremity, and this cleft travels over the wedge-shaped cores of the series or shunt bobbin, according as the one or the other predominates. By this device the pull on the armature is made uniform throughout its travel, and there is no need of weights or springs.

The electrical connections of the lamp will be understood from Fig. 3. When the lamp starts there are across the terminals three paths, and two that are important. One is a resistance of about one ohm as shown. This resistance performs an important office that will be presently considered. The second path is through the carbons, which are together, via the series coil. The third is the shunt bobbin, but at the start the current in this part is too small to be considered. The resistance is of such proportion that enough current passes through the series coil to start the lamp the moment the armature moves, and when the carbons are drawn apart R is cut out by a special cut-out, which is diagrammatically shown in the figure. The voltage of the lamp rises to its normal value. The shunt coil takes hold and regulates and feeds the lamp in the ordinary way.

There are two distinct automatic cut-outs in the Walker lamp which act under different circumstances.

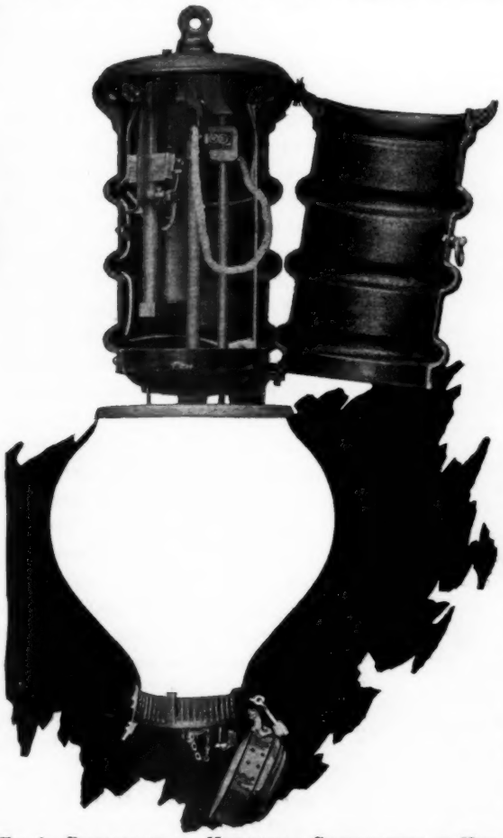


FIG. 2.—PHOTOGRAPH OF MECHANICAL CONSTRUCTION OF NEW WALKER ARC LAMP.

They are both mechanical, and one is operated by the same mechanism that operates the carbons, and the other by the upper carriage which supports the upper carbon.

The latter, which is in the base of the lamp, dead short-circuits the lamp when the carbons are burned out, and, as stated above, is actuated by the weight of the positive carbon carriage, which descends directly upon it. This cut-out is also moved by a lever from the outside when it is desirable to cut out the lamp for trimming or any other purpose.

The other cut-out has the same functions that the ordinary cut-out in a series arc lamp always has; namely, to provide a shunt-circuit for the current in case the carbons stick and fail to feed, or in case either carbon should be broken or, through some accident, become unduly separated.

It also provides a path for the current when the carbons are consumed, if for any reason the cut-out in the base of the lamp fails to act.

The resistance, which is inserted between the positive terminal and this cut-out, is for the purpose of shunting sufficient current through the series coil and carbons to start the lamp, and is common to all differential series arc lamps. In the Walker lamp this resistance is made of especially high-resistance wire, having a resistance approximately three times that of German silver, and also having mechanical properties, which are such that it can be heated to redness without affecting it in any way.

The convenience of the Walker arc lamp is one of its main features. Both the carbons are clamped at one end with a universal joint, and are made to nose together by two centering rings, which are as near the arc as is practicable. The upper centering ring consists of a bushing in the base of the case. The upper carbon is contained in the case with the mechanism and feeds out through this bushing. The globe is readily lowered for trimming, and is covered with a reflector plate which performs the double service of arresting the sparks and reflecting the light downward. The carbon dust can be brushed in the dust cap below, which can then be removed and emptied. These features are well illustrated in Figs. 2 and 4. It is important to note also that no part of the lamp frame is alive. The arc is practically stationary, and the heat on the globe is, therefore, uniform and not liable to crack it, as is the case with the traveling arc.

The Walker Company is making an inclosed arc lamp, and it is said that the new arc machine will soon be completed.

The extensive New York headquarters of this company are in charge of Mr. H. McL. Harding, one of the most widely known gentlemen in the electrical field.

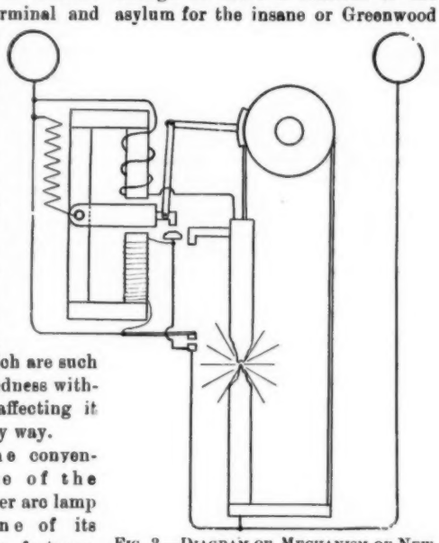


FIG. 3.—DIAGRAM OF MECHANISM OF NEW WALKER ARC LAMP.

FIG. 4.—SHOWING OPERATION OF CARBONS, NEW WALKER ARC LAMP.

Noisy Trolley Cars in Brooklyn.

TO THE EDITOR OF ELECTRICAL REVIEW:

A matter well worthy the attention of trolley roads management is that of abating or reducing the noisy running of their cars, which is one of the chief causes of opposition to trolley roads. It is my misfortune to live on a street where the noise is enough to drive a resident to the asylum for the insane or Greenwood cemetery. The cars run far in excess of the legalized speed, and the noise of an approaching car can be heard a block away—a sort of western sawmill attachment—or the knock, knock, slam bang of the "What-you-may-call-it". Is this necessary? I think not, in view of the ease and quiet running of the cars in Philadelphia, Boston, and other cities. Brooklyn is the chief noise producer in trolley cars, although Pittsburgh is a close competitor. This is a nuisance worthy of the attention of the management of trolley roads, and more than anything else is the cause of opposition and hatred against them. Are Brooklyn trolley managers wide-awake enough to appreciate this?

Yours truly,

HARD-TO-GET-ASLEEP-O'NIGHTS.

Brooklyn, N. Y., May 15.

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Now the Roentgen ray finds bullets and similar uninvited and unwelcome guests, even when embedded within the bones of the living body.

The Mont Cenis tunnel railway is to be equipped for electric traction, it is reported. The electric system is especially adapted for these long tunnels, and we would like to see them all supplied.

THE TELEPHONE INDUSTRY AND THE PATENT QUESTION.

We present in this issue the decision of the United States Supreme Court in the Berliner case in full, word for word, as written by the eminent and scholarly Justice Brewer, and this, we predict, concludes the important litigation over basic patents in the telephone field.

The Bell company, we have always believed, were entitled to the Berliner patent, and the honorable verdict given them by the highest court of the land is but a just one.

We do not believe that, when the decision is fully analyzed, the independent companies will fear the Berliner patent. If it has not already expired through limitation of a similar earlier foreign patent of the same inventor, as stated by good authority in another column, it is, to our mind, void through the fact that it is for the same invention for which a patent was granted to the same inventor in 1880. This is our opinion, and we so expressed it in 1894. If infringement suits are brought by the Bell company, we believe the result will justify this prediction, which is substantiated by the United States Supreme Court decision in Miller vs. the Eagle Manufacturing Company.

We do not believe, however, that the Bell management intend to rely on this patent for the preservation of the exclusiveness they have so long enjoyed. If they decide, as they should, to adopt a still more liberal policy with their licensees, encourage an energetic system of enlargement of established fields and continue their enormous business on its merits as a commercial industry, their business thus policied will inevitably grow to still more astonishing proportions. They should remember that the ablest men among their licensees are those who have strongly entrenched their companies in popular favor by constantly improved service, message rates, lower rentals, better lines and in all ways prepared for that fair and open competition which, apart from the patent question, was sure to come and is now at hand. If a monopoly continues, it should be a natural one, the result of superior and popular service.

We appreciate and respect those who desire the use of telephones to become more general, and those who make them and place them in the hands of the people for daily use. A large proportion of the people have demanded more economical service than could be obtained from the Bell companies in different parts of the country, and in many communities telephones had never been obtainable; and independent companies were organized in a perfectly legitimate way on the expiration of the controlling Bell patents, to secure to such people the service they demanded, by installing exchanges on a lower basis of tariff charges, and where they did not before exist. Progressive manufacturers have undertaken to supply the demands in the line of instruments and apparatus, many inventions had been made which now become available, and a large amount of capital has been invested in the independent field of operations. All this is entitled to recognition and will not fail to carry with it a wave of popular indorsement.

We have no sympathy with the bands of schemers which, from time to time, have obtruded in this line of business. It is usual for them to thrust themselves into any field of a money-making character, where they try to live on the alarm they create. This journal, alone among the electrical journals, exposed the Standard Telephone Company, of this city, with its millions of balloon-like capital. There were others, too, but the evidence obtainable was not so clear; and the aim of this journal is to be sure of its statements and just to all.

"He who runs may read," but he can hardly read or appreciate the great possibilities of the telephone. As a mere pyrotechnical comparison, the telephone has not made the display so impressively characteristic of the rise and progress of the electric light; but in the matter of result on the business economics of this end of the century, the telephone has a record never surpassed in the history of invention. And its record has by no means reached a limit; indeed, it is destined to become still more remarkable. The advances into popular use in the 20 years of its existence are as nothing to the giant strides it is destined to make in the next 10 years. Every farm-house, town and city and country residence, every provision and house-supply store, every professional man or woman, all the clergymen, and even the more prosperous workingmen, will have telephones and exchange connections at their instant demand, and the difficulties, constantly decreasing, of speech through the ordinary telephone will become unknown. Inventive activity and genius will find means to overcome the apparent difficulties of great increase in the exchange business, just as they have in the past in a minor degree. All this will come about gradually but surely, and the rate of progress will hardly be noticeable; but the change impressed on our whole life and methods will be tremendous. Ten years hence telephone statistics will present an array of figures at which the student of progress will stand amazed; but the tabulation will forever remain as one of the greatest monuments of man's ingenuity. In its intricacies the historian will decipher the names of thousands of men whose efforts will have led up to the world-wide use of the electric telephone.

EIGHT-PAGE TELEPHONE SUPPLEMENT—BERLINER DECISION IN FULL.

Electrical Review.

NEW YORK, WEDNESDAY, MAY 26, 1897.

THE BERLINER DECISION IN FULL.

THE EXACT WORDING OF THE DECISION OF THE UNITED STATES SUPREME COURT IN THIS IMPORTANT CASE—WRITTEN BY JUDGE D. J. BREWER.

THE UNITED STATES, Appellant, vs. THE AMERICAN BELL TELEPHONE COMPANY AND EMILE BERLINER.	Appeal from the United States Circuit Court of Appeals for the First Circuit.

[No. 344—October term, 1896.—May 10, 1897.]

On February 1, 1893, the United States filed in the Circuit Court of the United States in and for the District of Massachusetts a bill in equity against the American Bell Telephone Company and Emile Berliner, praying a decree to set aside and cancel patent No. 463,569, issued on November 17, 1891, to the telephone company, as assignee of Berliner. Upon amended pleadings and proofs the Circuit Court on January 3, 1895 (65 Fed., Rep. 86), entered a decree as prayed for. On appeal to the Court of Appeals for the First Circuit this decree was on May 18, 1895, reversed, and a decree entered directing a dismissal of the bill (33 U. S., App. 236). Thereupon the United States took an appeal to this court. A motion was made to dismiss the appeal for want of jurisdiction, which was denied (159 U. S, 548), and the case was argued upon the merits.

As stated by counsel for the appellant, four grounds for relief were presented and discussed in the Circuit Court. Those grounds are:

"1. That the delay of the application in the office for 13 years was, under the circumstances alleged in the bill, unlawful and fraudulent.

"2. That a patent, issued November 2, 1880, upon a division of the original application, covers the same invention as that covered by the patent in suit, and exhausted the power of the commissioner as to that invention.

"3. That the patent is not for the same invention which was described in the application as filed.

"4. That, taking the application to date from the time when it was made by amendment to cover the invention described and claimed in the patent as issued, it was barred by public use for more than two years."

By that court only the first two were considered, and the argument in the Court of Appeals was confined to those questions.

Mr. Justice Brewer delivered the opinion of the court:

This is a suit by the United States to set aside a patent for an invention as wrongfully issued. It is, we believe, the first case in this court in which upon proofs such an application has been presented. The right of the United States to maintain such a suit was affirmed in United States vs. Telephone Company (128 U. S., 315). The question now is, whether upon the facts disclosed in this record the relief prayed for ought to be awarded. It becomes, therefore, a matter of moment to determine under what circumstances and upon what conditions the United States are entitled to have a patent issued in due course of law set aside and canceled.

Many cases have come to this court, in which patents for lands have been sought to be set aside, and the rules controlling such suits have been frequently considered. Such decisions will naturally throw light upon the question here presented, though before adverting to them it may be well to note the difference between patents for land and patents for inventions. While the same term is used, the same grantor is in each, and although each vests in the patentee certain rights, yet they are not in all things alike. The patent for land is a conveyance to an individual of that which is the absolute property of the government and to which, but for the conveyance, the individual would have no right or title. It is a transfer of tangible property; of property in existence before the right is conveyed; of property which the government has the full right to dispose of as it sees fit, and may retain to itself or convey to one individual or another; and it creates a title which lasts for all time. On the other hand, the patent for an invention is not a conveyance of something which the government owns. It does not convey that which, but for the conveyance, the government could use and dispose of as it sees fit, and to which no one save the government has any right or title except for the conveyance. But for the patent the thing patented is open to the use of any one. Were it not for this patent any one would have the right to manufacture and use the Berliner transmitter. It was not something which belonged to the government before Berliner invented it. It was open to the manufacture and use of any one, and any one who knew how could contrive, manufacture and use the instrument. It conveyed to Berliner, so far as respects rights in the instrument itself, nothing that he did not have theretofore. The only effect of it was to restrain others from manufacturing and using that which he invented. After his invention he could have kept the discovery secret to himself. He need not have disclosed it to any one. But in order to induce him to make that invention public, to give all a share in the benefits resulting from such an invention, Congress, by its legislation, made in pursuance of the constitution, has guaranteed to him an exclusive right to it for a limited time; and the purpose of the patent is to protect him in this monopoly, not to give him a use which, save for the patent, he did not have before, but only to separate to him an exclusive use. The government parted with nothing by the patent. It lost no property. Its possessions were not diminished. The patentee, so far as a personal use is concerned, received nothing which he did not have without the patent, and the monopoly which he did receive was only for a few years. So the government may well insist that it has higher rights in a suit to set aside a patent for land than it has in a suit to set aside a patent for an invention. There are weightier reasons why the government should not be permanently deprived of its property through fraudulent representations or other wrongful means, than there are for questioning the validity of a temporary monopoly or depriving an individual of the exclusive use for a limited time of that whose actual use he claims to have made possible, and which, after such time, will be open and free to all. Bearing in mind this distinction, let us inquire upon what conditions the government may maintain a suit to set aside a patent for land.

These suits may be conveniently grouped in three classes: 1. Where the government being the only party interested, the patent is charged to have been obtained by fraud in representations or conduct. 2. Where the land by appropriate reservation is not subject to patent, but is, nevertheless, erroneously patented. 3. Where the land, though subject to patent in the ordinary administration of the land office, is patented to the wrong person either through fraud or by reason of mistake or inadvertence. In the first class are the following cases: United States vs. Hughes (11 How., 552); United States vs. Throckmorton (98 U. S., 61); United States vs. Atherton (102 U. S., 372); Moffat vs. United States (112 U. S., 224); United States vs. Minor (114 U. S., 233); Maxwell Land Grant Case (121 U. S., 325); Colorado Coal Company vs. United States (123 U. S., 307); United States vs. San Jacinto Tin Company (125 U. S., 273); United States vs. Silver Mining Company (128 U. S., 673); United States vs. Hancock (133 U. S., 193); United States vs. Trinidad Coal Company (137 U. S., 160); United States vs. Budd (144 U. S., 154); San Pedro, etc., Company vs. United States (146 U. S., 120). In the second are these: United States vs. Stone (2 Wall., 525); Leavenworth, etc., Railroad Company vs. United States (92 U. S., 733); McLaughlin vs. United States (107 U. S., 526); Western Pacific Railroad Company vs. United States (108 U. S., 510); Mullan vs. United States (118 U. S., 271); and in the third the following: Hughes vs. United States (4 Wall., 232); United States vs. Beebe (127 U. S., 338); United States vs. Marshall Mining Company (129 U. S., 579); United States vs. Missouri, etc., Railway (141 U. S., 358); United States vs. Southern Pacific Railroad Company (146 U. S., 570).

The second and third classes are not paralleled in this case, for it is not claimed that there was no invention, or that the patent was issued to the wrong party. The decisions in those classes need not be considered. The first class comprises all cases in which the land, though subject to patent and therefore within the jurisdiction of the land department, was charged to have been patented in consequence of fraudulent representations or conduct on the part of the patentee. The representations may have been as to the matter of right or the matter of quantity. The patentee may have been entitled to no land, or to less, or a different tract than that patented. In any event, fraud was the basis of the relief sought, and as fraud, actual or constructive in the issue of the patent, is the burden of this suit, we will quote from the opinions in some of these cases. In the Maxwell Land Grant case, Mr. Justice Miller, delivering the opinion of the court, said (page 381):

"We take the general doctrine to be, that when in a court of equity it is proposed to set aside, to annul or to correct a written instrument for fraud or mistake in the execution of the instrument itself, the testimony on which this is done must be clear, unequivocal and convincing, and that it can not be done upon a bare preponderance of evidence which leaves the issue in doubt. If the proposition, as thus laid down in the cases cited is sound in regard to the ordinary contracts of private individuals, how much more should it be observed where the attempt is to annul the grants, the patents, and other solemn evidences of title emanating from the Government of the United States under its official seal. In this class of cases, the respect due to a patent, the presumption that all the preceding steps required by the law had been observed before its issue, the immense importance and necessity of the stability of titles dependent upon these official instruments, demand that the effort to set them aside, to annul them, or to correct mistakes in them should only be successful when the allegations on which this is attempted are clearly stated and fully sustained by proof. It is not to be admitted that the titles by which so much property in this country and so many rights are held, purporting to emanate from the authoritative action of the officers of the government, and, as in this case, under the seal and signature of the President of the United States himself, shall be dependent upon the hazard of successful resistance to the whims and caprices of every person who chooses to attack them in a court of justice; but it should be well understood that only that class of evidence which commands respect, and that amount of it which produces conviction, shall make such an attempt successful."

In Colorado Coal Company vs. United States, Mr. Justice Matthews, after quoting part of the foregoing, adds (page 317):

"It thus appears that the title of the defendants rests upon the strongest presumptions of fact, which, although they may be rebutted, nevertheless can be overthrown only by full proofs to the contrary—clear, convincing and unambiguous. The burden of producing these proofs and establishing the conclusion to which they are directed rests upon the government. Neither is it relieved of this obligation by the negative nature of the proposition it is bound to establish. It is, indeed, sometimes said that a negative is incapable of proof, but this is not a maxim of the law. In the language of an eminent text writer: 'When the negative ceases to be a simple one—when it is qualified by time, place or circumstance—much of this objection is removed; and proof of a negative may very reasonably be required when the qualifying circumstances are the direct matter in issue, or the affirmative is either probable in itself, or supported by a presumption, or peculiar means of proof are in the hands of the party asserting the negative.'"

Then, after quotations from many authorities, the learned justice closes the discussion with these words from 1 Greenleaf on Ev. sec. 80:

"So, where the negative allegation involves a charge of criminal neglect of duty, whether official or otherwise; or fraud; or the wrongful violation of actual lawful possession of property; the party making the allegation must prove it; for in these cases the presumption of law, which is always in favor of innocence and quiet possession, is in favor of the party charged."

In United States vs. Marshall Mining Company, Mr. Justice Miller again refers to this matter, saying (p. 589):

"The dignity and character of a patent from the United States is such that the holder of it cannot be called upon to prove that everything has been done that is usual in the proceedings had in the land department before its issue, nor can he be called upon to explain every irregularity or even impropriety in the process by which the patent is procured."

With these declarations of the law controlling such cases we proceed to consider that which, according to the brief of counsel for the government, is the principal matter in this case. We quote their words:

"The delay in the office is the great fact in the case. It determined the bringing of the suit, stands in the forefront of the bill, was the principal question argued in both courts below, and occupies the chief space in the decisions rendered. It is not set up as laches, nor as a ground of forfeiture under any provision of the law or rule of the Patent Office, but as a course of conduct in the nature of fraud on the public."

What was the delay in this case? The application by Berliner was made on June 4, 1877, he having filed a caveat on April 14, 1877. In 1878, and prior to October 23, the telephone company purchased Berliner's invention, and on November 17, 1891, a patent was issued to the telephone company, as assignee of Berliner. The application was, therefore, pending in the department for 14 years, during 13 of which the invention was the property of the telephone company. The effect of this, it is said, is to prolong for all practical purposes the telephone monopoly during the lifetime of this patent; and in this way: On March 7, 1876, patent No. 174,465 was issued to Alexander Graham Bell, in which patent, as alleged in the bill and admitted in the answer, were described and claimed "a method of and apparatus for transmitting sound by means of an undulatory current of electricity". This was the original telephone patent. And it signified that Bell invented the telephone. That patent has expired and all the monopoly which attaches to it alone has ceased, and the right to use that invention has become public property. But while he invented the telephone, the apparatus he devised was inefficient for public uses. Berliner invented something by which, taken in connection with Edison's and Blake's inventions, Bell's undulatory current could be made practically available for carrying on conversation at long distances. In other words, the telephone, as we use it—that which has become such an important factor in the commercial and social life of today—does not embody simply the invention of Bell, but also those of Edison, Blake and Berliner. So that while the public has to-day, by reason of the expiration of the Bell patent, the right to use as it pleases his invention, such right is a barren one, and the telephone monopoly is practically extended to the termination of the Berliner patent. And this extension of the time of the monopoly has been accomplished by means of the delay in the issue of the Berliner patent, the long pendency of the application in the Patent Office. In order that the contention of the government may be clearly presented, and in view of the importance of this question, we may properly quote at some length from the brief of counsel:

"In the present case Mr. Bell's patent of 187 covered broadly the process of transmitting sound by means of an undulatory electric current, as distinguished from an interrupted or broken current, no matter how produced. His patent showed a transmitter capable of producing such a current, but so feebly that its use was limited to short distances. Afterwards Mr. Berliner discovered, we will say, that the undulatory current necessary to transmit speech can be produced by means of another form of transmitter—one operating by variation of pressure between its electrodes at their point of contact. But as the only function of the instrument was to produce an undulatory current, and as the use of that current, however produced, was covered by Mr. Bell's invention, it follows that the instrument was subject to two independent monopolies.

"Later, we will say, Mr. Edison discovered that the use of carbon as the material for the construction of the electrodes of the Berliner transmitter gave to that instrument a greatly increased power and reach of operation. Later still Mr. Blake devised a particular combination of carbon and metallic electrodes, with mechanism for their mounting, which secured an improved ease and permanence of adjustment and superior adaptation to common use. Mr. Bell hit upon the true principle, in relation to the kind of current to be employed, and was justly entitled to a patent for it, although the range of his transmitter may have been but a few hundred feet. Mr. Berliner, we will say, hit upon the true principle underlying the operation of the microphone, and was entitled to his patent, although the mechanism he used in the embodiment of his thought was so unstable in its adjustment as to make it of uncertain value. The inventions of Mr. Edison and Mr. Blake completed the instrument, and made possible the talking telephone in every man's house, the city exchange, and the long-distance line from city to city.

"It thus happened that the Blake transmitter introduced into public use by the Bell company in 1878, and familiar to us all, was the embodiment in one piece of mechanism, and its use of four distinct inventions made by four different men. That company was the owner of all the inventions. For Mr. Bell's invention it held patents issued in 1876 and 1877; for Mr. Blake's, patents were issued in 1881; and for the others, applications were on file subject to its control.

"Mr. Bell's invention was one of the first rank—nothing less than the discovery of a new law of nature. Mr. Berliner's invention was a beautiful intellectual conception of a mode of operation.

Mr. Edison's was the discovery of a new property of carbon. Mr. Blake's was an ingenious and a practical utilization of the three. Mr. Bell's invention lies at the foundation of the art of telephony. Mr. Edison's and Mr. Blake's have done more to make the art of practical value than all others following Mr. Bell.

"We assume that it was not possible to take out patents for all these inventions at the same time. And so far as that was not possible, the overlapping and prolongation of the monopolies created by the patents in the use of the carbon microphone could not be avoided without denying to some one or more of the inventors his rights under the law. But does it follow that the Bell company was entitled of right to hold control of the microphone under the broad claims of the Bell patent and the construction and combination claims of the Blake patents, and nurse the applications for the other inventions in the office, taking out a patent on Berliner's just in time to overlap Bell's and on Edison's in time to overlap Berliner, and so secure a monopoly on the same transmitter used in the same way to produce the same result for three times the period fixed by the statute for the duration of a patent?

"It needs no lawyer's argument to make manifest the inherent moral wrongfulness of such a proceeding toward the public. Every right-minded man will feel it instinctively. Would it be a legal wrong?"

After discussing the injury to the public which results from the conduct described, they add:

"Hence, a man who is enjoying a monopoly of a thing under one patent and is at the same time prosecuting an application for another patent which will give him a monopoly of the same thing for a further period is bound to speed his application."

It will be perceived that it is conceded that some delay is unavoidable. In the very nature of things that is so. It is not possible that an application for a patent can be considered and determined on the instant. So it is not the fact, but the excessiveness, of the delay of which complaint is made. The mere fact of delay does not, therefore, operate to deprive the inventor of his legal rights. Before he can be punished it must be shown that he has been guilty of a wrong—that he has caused the delay. It matters not whether the delay be reasonable or unreasonable, for a brief time or for many years, if the applicant is not responsible for it. Whatever may be the injury to the public, if the delay is caused solely through the negligence or inattention of the tribunal before which the application is pending, it is something for which the applicant is not responsible, and which does not affect his legal rights. There is often great delay in suits in the courts. Cases not infrequently are argued before the highest courts and not decided by them for weeks, and sometimes for years. Whatever effect such delay may have upon the interests of others or of the public, so long as it results from the mere non-action of the courts, the rights of the suitor are unaffected. He can not be punished on account of the delay of the tribunal before which he is presenting his suit.

Neither can a party pursuing a strictly legal remedy be adjudged in the wrong if he acts within the time allowed and pursues the method prescribed by the statute. If the statute gives him five years within which to bring an action on a note, he can not be denied relief simply because he waits four years and eleven months. If he has two years after a judgment against him within which to take an appeal, he may wait until the last day of the two years. Under Section 4886, Revised Statutes, an inventor has two years from the time his invention is disclosed to the public within which to make his application, and, unless an abandonment is shown during that time, he is entitled to a patent, and the patent runs as any other patent for 17 years from its date. He can not be deprived of this right by proof that, if he had filed his application immediately after the invention, the patent would have been issued two years earlier than it was, and the public, therefore, would have come into possession of the free use of the invention two years sooner. The statute has given this right, and no consideration of public benefit can take it from him. His right exists because Congress has declared that it should. It will not do to say that, because Congress has declared that 17 years is the life of a patent, 17 years is the limit of the possible monopoly; for the same legislation that gives 17 years as the life of a patent gives two years within which an application for a patent may be made, and during that time, as well as while the application is pending in the department, the applicant has practically, if not legally, an exclusive use. A party seeking a right under the patent statutes may avail himself of all their provisions, and the courts may not deny him the benefit of a single one. These are questions not of natural but of purely statutory right. Congress, instead of fixing 17, had the power to fix 30 years as the life of a patent. No court can disregard any statutory provisions in respect to these matters on the ground that in its judgment they are unwise or prejudicial to the interests of the public.

And in this connection it is also well to notice these facts: Section 4888, Revised Statutes, requires an inventor to make application in writing to the Commissioner of Patents. That and the two or three succeeding sections prescribe what the application shall state, and by what it shall be accompanied. Section 4893 provides that on the filing of the application and the payment of fees "the Commissioner of Patents shall cause an examination to be made of the alleged new invention or discovery; and if on such examination it shall appear that the claimant is justly entitled to a patent under the law, and that the same is sufficiently useful and important, the Commissioner shall issue a patent therefor". Section 4894 reads:

"All applications for patents shall be completed and prepared for examination within two years after the filing of the application, and in default thereof, or upon failure of the applicant to prosecute the same within two years after any action therein, of which notice shall have been given to the applicant, they shall be regarded as abandoned by the parties thereto, unless it be shown to the satisfaction of the Commissioner of Patents that such delay was unavoidable."

Certain rules of procedure have been prescribed by the Commissioner of Patents, and a certain routine of practice has become established in that department. Now, all these matters of statutory enactment, rules of procedure and routine of practice, are things over which an applicant has no control. When he has once filed his application, complying with the statutory requirements, then the Patent Office takes possession of the matter. It determines when and how it will act, and the applicant can only ask and wait.

And why should he be called upon to do more? He comes before the tribunal which the government has established and presents his application. Why should the validity of the grant which that tribunal finally makes depend in any degree upon the number of times he has repeated his application? The true rule is that if application has been made and the applicant has once called for action, he can not be deprived of any benefits which flow from the ultimate action of the tribunal, although that tribunal may unnecessarily, negligently, or even wantonly, if that supposition were admissible, delay its judgment. If the public is interested in prompt action, if the government which represents the public thinks that more speed on the part of any of its tribunals is essential, it is the government which is called upon to act, and the applicant may with propriety wait until either the tribunal has acted or until the government, having regard for the public interest, has interfered to compel action. Accepting the statement of counsel as to the facts to be correct in all its fullness, consider what would have been the ruling of a court if an application had been made to it based upon those facts. Suppose the applicant had presented its petition for a mandamus to compel prompt action on the part of the patent officials and said: "I have applied for, and am entitled to, a patent. It will be issued after awhile without any judicial compulsion. I can make large profits if the Patent Office will be dilatory, and yet I ask a mandamus to compel its immediate action", would not the ruling have been: "By your own showing you are entitled to no relief; you have no cause of complaint; it is the government, representing the public, which alone can complain". And if it could obtain no assistance by a suit in advance, can it be punished indirectly by being deprived of that which was finally awarded to it?

Much is said in the briefs and in the arguments about the practical continuance of the telephone monopoly. It is well to understand exactly what is meant thereby. No one questions that the Bell patent has expired, and that all of his invention is free to the use of the public. It is not denied that Berliner's invention is something independent and distinct from the Bell invention. It is the combination of these inventions with those of Blake and Edison which make the instrument in commercial use, and because this is the most serviceable it is the one that the public insists upon having. But each invention has independent rights. It loses nothing because when united with another it results in an instrument more valuable than either alone will give. Suppose that at the expiration of this Berliner patent some new invention shall be made by which in connection with those already free to the public an instrument can be manufactured far surpassing in utility that used to-day, and the Bell company shall purchase that invention, the public, which always insists on having the best and most serviceable, will undoubtedly take the new instrument, and in that way it may happen that what is called the telephone monopoly is practically still further continued. But surely that does not abridge the legal rights of any one. The inventor of the latest addition is entitled to full protection, and if the telephone company buys that invention it is entitled to all the rights which the inventor had. All that the patent law requires is that when a patent expires the invention covered by that patent shall be free to every one, and not that the public has the right to the use of any other invention, the patent for which has not expired, and which adds to the utility and advantage of the instrument made as the result of the combined inventions.

Counsel seem to argue that one who has made an invention and thereupon applies for a patent therefor, occupies, as it were, the position of a quasi trustee for the public; that he is under a sort of moral obligation to see that the public acquires the right to the free use of that invention as soon as is conveniently possible. We dissent entirely from the thought thus urged. The inventor is one who has discovered something of value. It is his absolute property. He may withhold the knowledge of it from the public, and he may insist upon all the advantages and benefits which the statute promises to him who discloses to the public his invention. He does not make the law. He does not determine the measure of his rights. The legislative body, representing the people, has declared what the public will give for the free use of that invention. He can not be heard in the courts to say that it is of such value that he is entitled to a larger and longer monopoly; that he is not fully compensated for the great benefit which his invention has bestowed by the pecuniary receipts during 17 years. No representative of the public is at liberty to negotiate with him for a new and independent contract as to the terms and conditions upon which he will give up his invention. He must come under the dominion of the statute, and take that which the public has proffered its willingness to give. As the lawmaking power has prescribed what the public will give, specified the terms and conditions of purchase, indicated the time and methods of determining the right of compensation, he on his part has an absolute legal right to avail himself of all the provisions thus made. It is not of course doubted that the courts in construing the patent, as all other statutes, must have regard to the spirit as well as the letter. That simply requires that courts shall ascertain their true meaning, but when that is ascertained the applicant for a patent is entitled to all the benefits which those statutes thus construed give.

What are the evidences of wrong in this matter of delay? It may have been caused either by the negligent or wrongful action of the officers of the department, and without any connivance, assistance or concurrence on the part of the applicant, or it may have been brought about by the applicant, either through its corruption of the public officers, or through other misconduct on its part. If the fault is wholly that of the department, the applicant ought not to suffer therefor. While, on the other hand, if its conduct has been wrongful, it may and ought to suffer. There is no presumption against the applicant. If a tribunal charged with official action delays such action, whatever of presumption surrounds the delay attaches to the tribunal, and no evidence of wrong being given, the presumption would be that the delay was at the instance of the tribunal and not caused by the applicant. The government, therefore, in order to make out its case, must affirmatively show that the delay has been caused in some way by the conduct of the applicant, and before its patent can be set aside, the government must, in accordance with the rules laid down in respect to land patents, establish that fact clearly. It may not rest on mere inferences, mere suggestions, but must prove the wrong in such a manner as to satisfy the judgment before it can destroy that which its own agents have created. We reiterate what was said by Mr. Justice Miller, for the court, in the Maxwell Land Grant case, that a suit between individuals to set aside an instrument for fraud can only be sustained when the testimony in respect to the fraud is clear, unequivocal and convincing, and cannot be done upon a bare preponderance of evidence which leaves the issue in doubt; and that if this be the settled rule in respect to suits between individuals it is much more so when the government attempts to set aside its solemn patent. And we may here again repeat that if this is true when the suit is to set aside a patent for land, which conveys for all time the title, *a fortiori* it must be true when the suit is one to set aside a patent for an invention which only grants a temporary right.

What evidence has the government produced? We premise by saying that there is not a scintilla of testimony as to any corruption of the officers of the department by the defendants, or any attempt at such corruption. Counsel do not put the finger on a single fact tending to show that any money was ever paid to any official of the Patent Office, or that any undue influence was ever attempted to be exerted upon or improper suggestion made to any one. So far as the record discloses, there never was an intimation made to a single official that he could profit in any way by a moment's delay. All thought of wrong in this respect may, therefore, be put aside. If there was no corruption on the part of the defendants, what did they do that calls for condemnation? And we turn to the brief of the learned counsel for the government to see what evidences of wrong they have found in the record. After noting that their inquiry begins at June 9, 1882, thus impliedly conceding that there is no reason to question the delay up to that time (a period of five years), they call attention to the subsequent correspondence between the solicitor in charge of the application and the officials of the department, which, so far as is material, is as follows:

"On June 9, 1882, the examiner wrote to the solicitor as follows:

'As at present advised it is believed that the claims presented may be allowed, but final action in this case must be suspended in view of probable interferences with other pending applications, which will be declared as soon as practicable.'

"On October 8, 1883, 16 months later, the solicitor wrote as follows:

'In June, 1882, I received an official letter dated the ninth of that month, saying that "the claims presented may be allowed, but final action is suspended in view of probable interferences". Since then I have been awaiting the official action. I beg to call attention to the case and ask that it may receive action.'

"October 23, 1883, the examiner, as follows:

'In response to applicant's letter filed October 9, 1883, it is stated that further action in this case on the part of the office must be still further postponed until the conditions of interfering applications will permit the declaration of interference, which seems unavoidable.'

"On February 19, 1886, two years and four months later, the solicitor, as follows:

'The specification is hereby amended as follows: Erase amendment O, filed December 16, 1881. Erase claims 3, 7, 8, 10 and 11, and change number of claims 4, 5, 6, 7 and 9, to 3, 4, 5, 6 and 7.'

"This amendment contained nothing material to the present discussion.

"March 17, 1886, the examiner, as follows:

'In response to amendment of February 19, 1886, applicant is advised that the broad claims involving the idea of a variable pressure-contact telephone will probably be involved in an interference with a pending application or applications of another applicant, and that said applicant has been advised that he must show that the office action taken in the matter of his application is not a sufficient answer thereto on or before the 1st of April, 1886. In the meanwhile this application will be suspended from further action.'

"August 13, 1886, five months later, the solicitor:

'I desire to be informed of the present status of this case, and to be advised if the office is awaiting any action on the part of the applicant. It is desired that no rights should be lost by inaction.'

"August 19, 1886, the examiner, as follows:

'In response to applicant's letter of the 13th instant, he is hereby advised that the delay in this case is a matter over which he has no control, except it be, perhaps, in the matter of urging an early interference. The interference will be declared as soon as the other applicants are in condition, if it be decided that they are entitled to the same. The office is awaiting no action on the part of the applicant, and the delay is through no fault of his.'"

After these quotations, counsel observe as follows:

"These perfunctory exchanges of compliments between the solicitor and the examiner occupied the entire time from June 9, 1882, to March 16, 1888, five years, nine months and seven days. In all that time not a demand for action, not a hint even of dissatisfaction, appears in the record. We have quoted it all. Of course, this appearance of willing acquiescence is not conclusive. The examiner's letters indicate an obstacle in the way; some portending interference or interferences, always coming, yet never arriving. But the supine submission of the company to such extraordinary delay, for such a cause, is the first item of the proof. If it had been possessed of a real purpose to have its patent as soon as possible, if it had been losing millions per annum for want of it, as the people are losing millions because of it, would it not have found some way to force this invisible foe into the field, or at least leave on the record some trace of its mighty effort to burst the bands of official routine which prevented it from finding and fighting him?"

This presents the burden of the case on the part of the government. It amounts to only this: The defendant company was not active but passive. If millions were to be added to its profit by active effort it would have been importunate and have secured this patent long before it did. As millions came to it by reason of its being passive, it ought to suffer for its omission to be importunate. It must keep coming before the commissioner, like the widow before the unjust judge in the parable, until it compels the declaration, "though I fear not God nor regard man, yet, because this widow troubleth me, I will avenge her, lest by her continual coming she weary me". But is this the rule to measure the conduct of those who apply for official action? What is the amount of the importunity which will afford protection to the grant finally obtained? How frequent must the demand be? It is easy to say that the applications of this defendant, coming only at the interval of months and years, were, taken with the replies of the Patent Office, mere "perfunctory exchanges of compliments", but this does not change the fact that action was asked and repeatedly asked; that no request was made for delay, no intimation that it was desired or would be acceptable.

In this connection may well be noticed the letter of the solicitor, in March, 1881, to the commissioner, in which he urged the modification of rule No. 94 in respect to interferences, and this in order to hasten the issue of the patent. In this letter, besides pointing out how the rule, as it then existed, would tend to delay, he adds these statements:

"So far as my client is concerned, I have to submit that it is of the utmost importance that the interference be declared forthwith. . . .

"The indefinite suspension of the interference would only create harassing and oppressive claims after the public had become possessed of the invention without hinderance or objection on the part of the inventor, and it is but just to say that neither of the interfering applicants could, with any degree of propriety, claim to be the inventor and expect that such notice on his part would be treated by the public with any degree of respect. Patents issued as the result of long pending interferences are always looked upon as odious monopolies because of the manner in which they are enforced at the time when the public was already possessed of the invention. . . .

". . . An early decision upon the question submitted is earnestly requested."

It may be added that the modification was made in October, 1881.

In respect to this letter, and especially the second paragraph, quoted above, counsel for the government say:

"In the argument below, counsel appeared to think that once was enough, and that they stood as a perpetual exhortation to duty to the examiner and all his successors as though they had been nailed on his office door. But they were not even in the file of the Berliner case. Examiner Freeman, whose report was endorsed on the letter, went out of office in 1883. If any one ever saw it after that until it was exhumed for the purpose in this case, the fact does not appear in the record."

But is the applicant to be condemned because, having once made an urgent request for action and pointed out reasons therefor, it was not continually repeating that request, because it did not see that such request was placed on the files of this particular application, or, as intimated in the words of counsel, nailed on the doors of the Patent Office?

It is, of course, easy to say that these applications, these suggestions and requests meant nothing; that they were a mere blind; but something more than assertion of counsel is necessary to destroy their significance, or to establish collusion between the applicant and the officials of the department. But the case does not stand upon the fact that the formal communications from the solicitor in charge of this application were few in number. While in every one, in which the matter was referred to, there was a request for action, it also appears from the testimony of Messrs. Freeman, Lyons and Kintner, who were the examiners in charge during the major portion of the time in dispute, that the representatives of the Bell company were urgent in pushing the Berliner application. For instance, Examiner Lyons testified:

"They were urgent and persistent beyond toleration. Hardly a day passed without somebody, representing the interests of the Bell Telephone Company, coming to our room and urging the allowance of the Berliner case, or the declaration of interferences. I, myself, was waylaid in the halls of the Patent Office, and on more than one occasion did I sneak into the room to avoid being bored by Mr. Lockwood, Hedrick, the assistant of Mr. Pollok. Mr. Pollok, himself, also, although less frequently, came to the room, and later on, notably toward the end of 1884, and in the Spring and Summer of 1885, Mr W. W. Swan was a frequent visitor in the electrical division."

And Examiner Kintner, who was in office from May, 1883, to April, 1887, in reply to a question as to what Mr. Swan, one of the representatives of the telephone company, did in respect to the application, said:

"I had a great many interviews with him in the matter of both the Edison and the Berliner applications under consideration, and he was very persistent in urging the passage of both applications to patent; in fact, to such an extent that his persistency annoyed me not a little."

Another matter referred to by counsel is what they call the "tacit understanding". The facts are these: One Daniel Drawbaugh claimed to have invented the telephone prior to Bell. He assigned his inventions to the People's Telephone Company, between whom and the defendant company a heated and protracted litigation arose. Now, it is said that there was an agreement, or, at least, a tacit understanding, between the officials of the Patent Office, the People's company and the defendant company that the proceedings in the Patent Office in respect to the Berliner application should wait the determination of the litigation between the two telephone companies. It is insisted that the officials had no right to enter into such an agreement; that it was unlawful in its character. Assuming that this is so, still the fact appears that the proposition therefor came from the representatives of the Drawbaugh interest, that it was deemed by the officers of the Patent Office to be for the best interests of all, and that it was simply assented to by the defendant. Nowhere does it appear that the defendant urged, or even suggested, the propriety of such a delay. For the present we do not consider the wisdom or the rightfulness of the course pursued. All that we desire to notice is that it was not at the instance of the defendant.

It is further said that, even if there were at first any excuse for such "tacit understanding", and the Patent Office properly delayed action on this application until after the litigation between Drawbaugh and Bell had ended, a judgment therein was rendered in the Circuit Court in 1884; and that then the office should have proceeded promptly, and that there was no excuse for waiting until the decision of the appeal by this court in 1888; and least of all for any delay after that final decision by this court.

Summing up their argument on this branch of the case counsel say:

"The review of the history of the Berliner application, which we have now completed, shows that in its treatment of it the office proceeded upon two unlawful assumptions.

"The first was that an applicant, whose application is ready for issue, except for a possible threatened interference, must wait until the antagonizing application is either found allowable and ready for the interference, or finally ejected from the office, no matter how long that may be. This assumption governed the action of the examiners from 1882 to the issue of the patent. . . .

"The second assumption was that the judicial determination of the question of Drawbaugh's invention, in the suit between the owners of the applications, was not enough to warrant action by the office. Examiner Kintner took the ground, in conversation with Mr. Swan—never on the record—that the decision of the Circuit Court was not enough for him; that the case might be appealed, and he would act only on the decision of the Supreme Court. But when that came, it received no more consideration than had been given to that of the Circuit Court."

Were it conceded that these two assumptions were "false assumptions", as counsel call them, what are they but errors of judgment on the part of the patent officials as to the course of procedure; and can it be possible that an applicant for a right, who has under the statute no choice of tribunals or course of procedure, but is compelled to apply to one tribunal which has exclusive jurisdiction in the matter, and must abide by its rulings as to procedure, can be held to have forfeited his right simply because of errors of judgment by such tribunal as to the procedure? The statement of the question seems to us to carry its own answer. It is true counsel follow this declaration of the errors on the part of the office in the matter of procedure with the further statement:

"The guilty party is the Bell company. It had a full and perfect inside view of the whole situation from the beginning. Its attorneys were wiser in these things than the commissioners or the examiners. They shrewdly availed themselves of every unauthorized usage, mistaken assumption, ignorant misconception, or supposed obstacle, by means of which the issue of the patent could be delayed without apparent responsibility on their part. In view of the duty which vested upon the company to speed the application, that was fraud, not less but more reprehensible because it was not of the common and gross kind, but so refined and acute that its garb of professed innocence has deceived even the Court of Appeals."

The difficulty with this charge of wrong is that it is not proved. It assumes the existence of a knowledge which no one had; of an intention which is not shown. It treats every written communication from the solicitor in charge of the application, calling for action, as a pretense, and all the oral and urgent appeals for promptness as, in fact, mere invitations to delay. It not only rejects the testimony which is given, both oral and written, as false, but asks that it be held to prove just the reverse.

Indeed, the case which the counsel present to us may be summed up in these words: The application for this patent was duly filed. The Patent Office, after the filing, had full jurisdiction over the procedure; the applicant had no control over its action. We have been unable to offer a syllable of testimony tending to show that the applicant ever in any way corrupted or attempted to corrupt any of the officials of the department. We have been unable to show that any delay or postponement was made at the instance or on the suggestion of the applicant. Every communication that it made during those years carried with it a request for action; yet because the delay has resulted in enlarged profits to the applicant, and the fact that it would so result ought to have been known to it, it must be assumed that in some way it did cause the delay, and having so caused the delay ought to suffer therefor. There is seldom presented a case in which there is such an absolute and total failure of proof of wrong.

The defendant company might safely have left the case here, but it has not been content to rest the controversy with the failure on the part of the government to show any wrong. It has not been content to accept the Scotch verdict of "not proven". It has called as witnesses the examiners who were in charge of this application, and taken their testimony as to what did in fact take place, and as to how and why the long delay occurred. Whatever judgment may be pronounced upon the wisdom of the course pursued by these officials, or the sufficiency of the reasons given by them therefor, there is no ground for controverting that they acted in good faith. The case is not one of arbitrary, peremptory postponements and delay.

They supposed they were acting in compliance with the rules of the Patent Office, and out of proper regard for the rights of conflicting interests. No just estimate can be placed upon the propriety of their conduct without taking into consideration the whole subject of telephonic inventions and litigation. As heretofore stated, and as is well known, Bell claimed to be the pioneer in this matter of telephonic communication. His claim was disputed, and out of that dispute came the most important, the most protracted litigation which has arisen under the patent system in this country. For years this litigation was pending in the trial courts, subsequently brought to this court, and finally decided in 1888. So great was this litigation, so immense the volume of testimony, and so important the rights involved, that it is the only case in the history of this court to which an entire volume of our reports is devoted. (126 U. S.) The argument was protracted through weeks, and the case was held under consideration for a year, and finally decided by a closely divided court. Is it strange that, when the primary right was being so vigorously contested, and was so much a matter of doubt, when (as appears from the testimony in this case) the judgment of the law department was adverse to the claims of Bell, and to the validity of the patent which he had obtained—is it strange, we ask, in view of these facts that the disposition of the apparently minor matter should be held in abeyance in the Patent Office until a final decision of the primary right?

Neither can any just estimate be placed upon their conduct without taking into account the volume of business, and the pressure on account thereof, in the Patent Office. Beyond the fact, which is a matter of common knowledge, that thousands of applications are filed and thousands of patents granted each year, the record discloses something as to the multitude of applications for patents for telephones and telephonic devices which were pending during these years. Mr. Townsend, who was an examiner up to November 15, 1880, while unable to state the number of applications, was able to say that he had examined over 120 that went to patent. This it will be remembered was in the early days of telephonic investigation and invention. It appears also from a communication made by the Commissioner of Patents to the Secretary of the Interior, on December 13, 1892, advising against this suit, that at that time a gentleman, who is called in the letter the "relator", had pending in the Patent Office 152 applications for patents on telephones and telephone system. These facts may be only side lights, but they show that the examiners and other officials in the Patent Office had something else to do besides considering this application.

Of course, it is easy to say that the Patent Office could have disposed of this application more promptly than it did; that it ought to have done so, and that, in view of the termination of the great litigation favorable to the claims of Bell, its delay has resulted in large pecuniary benefits to the defendant. But a wisdom born after the event is the cheapest of all wisdom. Anybody could have discovered America after 1492. The question is not whether a better judgment on the part of the patent officials would have disposed of this application long before it was, is not indeed whether there was any error of judgment, but whether they acted wrongfully and their action was induced by or at the instance of the defendant.

One thing more deserves notice. The argument of the counsel for the government proceeds all along on the assumption of the superior knowledge of the representatives of the defendant company; that they saw the end from the beginning; that they knew that their client had an invention which was patentable and that they would ultimately obtain a patent therefor, and also that Bell was and would finally be adjudged the primary inventor of the telephone, and that, possessed of all of this knowledge, they planned the delay in securing the Berliner patent in order that thereby they might extend to the termination of its life the telephone monopoly. But what an assumption this is and how illy justified by the facts! The very process and termination of the Bell-Drawbaugh litigation demonstrates the doubtfulness of the question there in issue, and is absolute evidence that there was up to the close of that litigation an uncertainty as to the result. Equally uncertain was the outcome of the Berliner application. Indeed, there is an uncertainty as to every application. No one can foretell what will be the judgment of the Patent Office upon the questions of novelty and utility. And in respect to this Berliner application the matters which are subsequently to be considered attest that there was more than ordinary doubt as to the outcome. On account of those matters it is earnestly contended that there was no merit in the application, and that it ought to have been denied. Further than that, they knew that the officials of the Patent Office were subject to change—as, in fact, they were changed during the pendency of these proceedings—and even if they had any direct intimations from the first examiner or the first commissioner, there was no certainty that a subsequent examiner and subsequent commissioner would entertain the same views. If the Bell-Drawbaugh litigation had terminated the other way and a different opinion on the part of a single member of this court would have changed this result, or if when the time came the Commissioner of the Patent Office had decided against the Berliner application, and his decision been sustained on appeal to the Supreme Court of the District of Columbia, then all this brilliant scheme of realizing millions would have vanished into thin air. If they were possessed of the wisdom which the government attributes to them, the representatives of the Bell company must have realized that the certainty which attends a final decision and the issue of a patent was something worth striving for, and not lightly to be ignored. And if this underlying assumption has so little foundation, what shall be said of an inference and an imputation unsupported by evidence and based upon that assumption?

Our conclusions on this branch of the case are: First, that before the government is entitled to a decree canceling a patent for an invention on the ground that it had been fraudulently and wrongfully obtained, it must, as in the case of a like suit to set aside a patent for land, establish the fraud and the wrong by testimony which is clear, convincing and satisfactory. Second, that Congress has established a department with officials selected by the government, to whom all applications for patents must be made; has prescribed the terms and conditions of such applications, and entrusted the entire management of affairs of the department to those officials; that when an applicant for a patent complies with the terms and conditions prescribed and files his application with the officers of the department he must abide their action, and can not be held to suffer or lose rights by reason of any delay on the part of those officials, whether reasonable or unreasonable, unless such delay has been brought about through his corruption of the officials, or through his inducement, or at his instance. Proof that they were in fault, that they acted unwisely, unreasonably, and even that they were culpably dilatory, casts no blame on him and abridges none of his rights. Third, the evidence in this case does not in the least degree tend to show any corruption by the applicant of any of the officials of the department, or any undue or improper influence exerted or attempted to be exerted by it upon them, and on the other hand does affirmatively show that it urged promptness on the part of the officials of the department, and that the delay was the result of the actions of those officials. And, fourth, if the circumstances do not make it clear that this delay on the part of the officials was wholly justified, they do show that it was not wholly unwarranted and that there were reasons for the action of such officials, which at least deserve consideration and can not be condemned as trivial.

The three remaining grounds of relief asserted by the government may be considered together. Defendants contend that as the last two, although urged in the Circuit Court, were not presented to the Court of Appeals (referring for this fact to the opinion of the latter court and also a notice which was contained in the brief of counsel for the government), we are precluded from noticing them, citing as authority Bell vs. Bruen (1 How., 169); Alviso vs. United States (8 Wall., 337); National Bank vs. Commonwealth (9 Wall., 353); Rogers vs. Ritter (12 Wall., 317); Klein vs. Russell (19 Wall., 433); Supervisors vs. Lackawana company (93 U. S., 619); Wilson vs. McNamee (102 U. S., 572); Wood vs. Weimar (104 U. S., 786); Topliff vs. Topliff (145 U. S., 156); McGahan vs. Bank of Rondout (156 U. S., 218); and Carr vs. Fife (156 U. S., 494); in which cases, with more or less particularity, the proposition is announced that this court will not consider questions not presented to and passed upon by the lower court. We deem it unnecessary to determine how far that rule is applicable in this case, for the reasons which compel us to deny relief on the first of these grounds are, when applied to the facts developed by the testimony, equally potent as to the others. That ground, as stated, is "that a patent issued November 2, 1880, upon a division of the original application covers the same invention as that covered by the patent in suit and exhausted the power of the commissioner as to that invention". The patent of 1880 is for a receiver; that of 1891 for a transmitter. It is claimed that the two instruments are alike in form and alike in function, save as they are operated at different ends of the telephone wire. The transmitter can be placed at the other end of the wire and then becomes a receiver, and so vice versa. Popularly speaking, it may be said that the transmitter takes the varying sounds of the human voice and passes them on to the telephone wire, to be borne along thereon by the undulatory electric current until they reach the receiver, which takes and passes them to the human ear. In a sense the receiver is also a transmitter, for it passes the sounds from the wire to the ear. We agree with the Court of Appeals that it is unnecessary to determine whether there are two separate inventions in the transmitter and the receiver, or whether the patent of 1891 is for an invention which was covered by the patent of 1880. The judgment of the Patent Office, the tribunal established by Congress to determine such questions, was adverse to the contention of the government, and such judgment can not be reviewed in this suit.

Suits may be maintained by the government in its own courts to set aside one of its patents not only when it has a proprietary and pecuniary interest in the result, but also when it is necessary in order to enable it to discharge its obligations to the public, and sometimes when the purpose and effect are simply to enforce the rights of an individual. In the former cases it has all the privileges and rights of a sovereign. The statutes of limitation do not run against it. The laches of its own officials does not debar its right. (Von Brocklin vs. Tennessee, 117 U. S., 151; United States vs. Nashville Railway Company, 118 U. S., 120; United States vs. Insley, 130 U. S., 263.) But when it has no

proprietary or pecuniary result in the setting aside of the patent; is not seeking to discharge its obligations to the public; when it has brought the suit simply to help an individual, making itself, as it were, the instrument by which the right of that individual against the patentee can be established, then it becomes subject to the rules governing like suits between private litigants. As said in United States vs. Beebe (127 U. S., 338, 347):

"We are of the opinion that when the government is a mere formal complainant in a suit, not for the purpose of asserting any public right or protecting any public interest, title or property, but merely to form a conduit through which one private person can conduct litigation against another private person, a court of equity will not be restrained from administering the equities existing between the real parties by any exemption of the government designed for the protection of the rights of the United States alone. The mere use of its name in a suit for the benefit of a private suitor can not extend its immunity as a sovereign government to said private suitor, whereby he can avoid and escape the scrutiny of a court of equity into the matters pleaded against him by the other party; nor stop the court from examining into and deciding the case according to the principle governing courts of equity in like cases between private litigants." See also United States vs. Des Moines, etc. Co. (142 U. S., 510); Curtner vs. United States (149 U. S., 662).

Now, in the case at bar the United States has no proprietary or pecuniary interest. The result, if favorable to it, would put no money in its treasury or property in its possession. It has a standing in court either in the discharge of its obligation to protect the public against a monopoly it has wrongfully created, or simply because it owes a duty to other patentees to secure to them the full enjoyment of the rights which it has conferred by its patents to them. Perhaps both of these objects were in view. In so far as the latter was, and is, the purpose of this suit, it brings it within the rule laid down in United States vs. Beebe, supra. Doubtless the removal from the public of the burden of a monopoly charged to have been wrongfully created was also one of the objects, and perhaps the principal object. (United States vs. American Bell Telephone Company, 159 U. S., 548.) To what extent this may relieve the government as suitor from all the rules governing the suits of private individuals need not be specifically determined here.

One of the familiar rules of equity, reinforced by statute (Section 723, Revised Statutes), is that "suits in equity shall not be sustained in either of the courts of the United States in any case where a plain, adequate and complete remedy may be had at law". The objection to the validity of this patent on the ground that it was already covered by the patent of 1880 is a defense which, under the statutes (Section 4920, Revised Statutes), is open to every individual charged by the patentee with infringement, whether the proceeding against him be an action at law or a suit in equity. The government, therefore, if seeking simply to protect the right of an individual, ought not to be permitted to maintain a suit in equity to cancel that against which the individual has a perfect legal defense available in any action brought by or against him. The query is pressed whether the same rule would not also apply when the government is only seeking to protect the public at large, for the public is but the aggregation of all the individuals, and if each of them has a perfect defense to the patent, so all together have. Again, and as an illustration perhaps of the extent of the rule referred to, it has often been held that while one having the title to and possession of a tract of land can maintain a suit in equity to cancel a deed or other instrument which is a cloud upon the title, such suit can not be sustained if the deed or instrument is void upon its face, its invalidity resting upon matters of record, and not affected by any lapse of time or statute of limitations. In other words, the deed or instrument is not considered a cloud if it can never be used to destroy his title or disturb his possession. The objection to this patent on the ground stated is an objection resting upon matters of record—of record in the Patent Office; not dependent on oral testimony nor subject to change, and in no way affected by lapse of time. Within the scope of this specific application of the general rule it would seem that equity has no jurisdiction either at the suit of the government or of an individual to formally cancel that which by record and unfailing evidence is, as claimed, absolutely void.

But, further, Congress has established the Patent Office, and thereby created a tribunal to pass upon all questions of novelty and utility. It has given to that office exclusive jurisdiction in the first instance, and has specifically provided under what circumstances its decisions may be reviewed, either collaterally or by appeal. As said in Butterworth vs. Hoe (112 U. S., 50, 67): "That it was intended that the Commissioner of Patents, in issuing or withholding patents, in reissues, interferences and extensions, should exercise quasi judicial functions, is apparent from the nature of the examinations and decisions he is required to make, and the modes provided by law, according to which, exclusively, they may be reviewed."

Sections 4911 to 4914, Revised Statutes, grant appeals in certain cases to the Supreme Court of the District of Columbia. It is true those sections do not authorize appeals on behalf of the government, but the failure so to do may be evidence that Congress thought the government ought not to interfere; and because it believed it had made ample provision for securing the rights of all without the intervention of the government. Section 4915, Revised Statutes, authorizes a suit in equity on behalf of an applicant for a patent whose application has been refused. Morgan vs. Daniels (153 U. S., 120), presented a controversy under that section, and in the opinion, on page 124, we said: "It is a controversy between two individuals over a question of fact which has once been settled by a special tribunal, entrusted with full power in the premises. As such it might be well argued, were it not for the terms of this statute, that the decision of the Patent Office was a finality upon every matter of fact."

It is true that all these sections refer to proceedings between individuals, but the government is as much bound by the laws of Congress as an individual, and when Congress has created a tribunal to which it has given exclusive determination in the first instance of certain questions of fact and has specifically provided under what circumstances that determination may be reviewed by the courts, the argument is a forcible one that such determination should be held conclusive upon the government, subject to the same limitations as apply in suits between individuals.

There is nothing in United States vs. Bell Telephone Company (128 U. S., 315), and United States vs. American Bell Telephone Company (159 U. S., 548), to conflict with the views above expressed. In the former case the question presented was whether the government could maintain a bill to set aside a patent for an invention on the ground of fraud in its issue, and among the objections urged was the fact that Congress had, in Section 4920, Revised Statutes, made specific provision for certain defense, in suits by an infringer. It was held that the government could maintain such a bill and that these special statutory provisions did not defeat its right, the court summing up the discussion in these words (page 373):

"The argument need not be further extended. There is nothing in these provisions expressing an intention of limiting the power of the Government of the United States to get rid of a patent obtained from it by fraud and deceit. And although the legislature may have given to private individuals a more limited form of relief, by way of defense to an action by the patentee, we think the argument that this was intended to supersede the affirmative relief to which the United States is entitled, to obtain a cancellation or vacation of an instrument obtained from it by fraud, an instrument which affects the whole public whose protection from such a fraud is eminently the duty of the United States, is not sound."

In the latter case, which is the one now before us, there was decided a motion to dismiss for want of jurisdiction in this court of an appeal from the decision of the Court of Appeals, and it was adjudged that this court had jurisdiction. It is true, at the close of the opinion is found this general statement as to the power to maintain such a suit (page 555):

"In United States vs. Telephone company (supra), it was decided that where a patent for a grant of any kind issued by the United States has been obtained by fraud, by mistake or by accident, a suit by the United States against the patentee is the proper remedy for relief, and that in this country, where there is no kingly prerogative, but where patents for land and inventions are issued by the authority of the government, and by officers appointed for that purpose, who may have been imposed upon by fraud or deceit, or may have erred as to their power, or made mistakes in the instrument itself, the appropriate remedy is by proceedings by the United States against the patentee."

But while there was thus rightfully affirmed the power of the government to proceed by suit in equity against one who had wrongfully obtained a patent for land or for an invention, there was no attempt to define the character of the fraud, or deceit, or mistake, or the extent of the error as to power which must be established before a decree could be entered canceling the patent. It was not affirmed that proof of any fraud, or deceit, or the existence of any error on the part of the officers as to the extent of their power, or that any mistake in the instrument was sufficient to justify a decree of cancellation. Least of all was it intended to be affirmed that the courts of the United States, sitting as courts of equity, could entertain jurisdiction of a suit by the United States to set aside a patent for an invention on the mere ground of error of judgment on the part of the patent officials. That would be an attempt on the part of the courts in collateral attack to exercise an appellate jurisdiction over the decisions of the Patent Office, although no appellate jurisdiction has been by the statutes conferred. We are of opinion, therefore, that the question, as stated, is not open for consideration in this case. We see no error in the decision of the Court of Appeals, and its decree, dismissing the bill, is affirmed.

Mr. Justice Harlan dissented.

Mr. Justice Gray and Mr. Justice Brown were not present at the argument, and took no part in the decision.

HAS THE BERLINER PATENT EXPIRED?

In the Opinion of Dr. Geo. H. Benjamin, an Eminent Patent Attorney, it Expired in 1894 Through the Expiration of a Prior English Patent to Berliner.

DR. BENJAMIN'S INTERESTING AND IMPORTANT COMMUNICATION.

TO THE EDITOR OF ELECTRICAL REVIEW:

The Supreme Court of the United States recently handed down an opinion in which it was held that United States Letters Patent No. 463,569, granted November 17, 1891, to E. Berliner for telegraph and telephone, and otherwise known as the Berliner telephone patent, was valid.

The daily press in commenting upon this decision has either directly stated, or left it to be inferred, that the effect of this decision is to extend the monopoly of the Bell Telephone Company for 17 years from November 17, 1891, i. e., until 1909. As such conclusion is entirely erroneous, and as the public is deeply interested in the matter, I would call your attention to the following facts:

The proceeding before the Supreme Court was an action brought on behalf of the people of the United States, by the Attorney General, to annul the patent. The grounds of relief set forth in the bill of complaint were as follows:

(*a*) That the delay of the application in the Patent Office for 13 years was unlawful and fraudulent.

(*b*) That the invention embraced in the patent was included in a prior patent to the same inventor, issued in 1880.

(*c*) That the patent, as issued, was not for the invention described in the original application.

(*d*) That the invention described in the patent was not the invention sworn to in the original application, but an entirely different invention introduced by amendment more than two years after said invention had been in public use and on sale.

The Supreme Court in its decision refused to consider any of the grounds of relief except that mentioned under *a*, and as to that ground found that the delays in the Patent Office were not chargeable to Mr. Berliner or his assignees, but were the fault of the Patent Office, and that the allegations of fraud were not proved. As to the grounds mentioned under *b*, *c* and *d*, the court said that they relate to statutory grounds of defense which could be urged in a suit for infringement, but which could not be considered in an action in equity to set aside a patent.

The effect of the decision of the Supreme Court, therefore, is to put the patent where it stood before the government commenced its action to annul the patent. In other words, there is a United States patent which *prima facie* is valid.

The pertinent point, however, now is, is the patent valid? This I think can be answered in the negative, and for the reason that prior to the date of the issue of the Berliner patent, Mr. Berliner, on January 8, 1880, applied for a patent for the same invention in England, which patent was issued as No. 91, and sealed on July 7, 1880. This patent expired by limitation of the grant on January 8, 1894; consequently, under the provisions of Section 4887 of the Revised Statutes, i. e.,

"but every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent,"

the Berliner patent has expired.

Of course the Bell Telephone Company claims that the English patent of 1880 does not describe "the same invention", and hence does not limit the life of the American patent; but those best informed are fully convinced that this position can not be maintained. Respectfully,

GEO. H. BENJAMIN.

New York, May 17.

Mr. Keelyn's Opinion of the Berliner Decision.

TO THE EDITOR OF ELECTRICAL REVIEW:

My opinion, personally, having been asked upon the recent decision of the Supreme Court, I beg to state, briefly: The Supreme Court decision in the Berliner patent case was a victory for the people and a defeat for the Bell company. There were four points of contention, any of which might have been a defeat for the Bell company, in case of favorable action. Upon these three points the Bell attorneys fought with all their vigor against adjudication, indicating their absolute fear of the result. If they had had confidence in it, they would have brought an adjudication upon all of them. If they had had confidence in any one of them, they would have endeavored to take advantage of it by getting a favorable decision. Their whole effort was to prevent a decision upon any other point than that of alleging fraud upon their part in delaying the issue of the patent. They gained upon this point, but lost upon the three others, for there is hardly a doubt that they could have had an adjudication by the Court of Appeals upon the other points, if they had not fought it so severely.

Therefore, their fears are substantiated by facts and, taken all in all, the farcical litigation between the Bell people and the government is, in fact, a victory for the people.

Very truly,

J. E. KEELYN.

Chicago, Ill., May 17.

There is a telegraph and telephone line between Chicago and Milwaukee that is a mutual concern. The patrons own the line and pay five cents a message. The line has paid for itself and the cost of operation, and returns a dividend annually. The dividends are applied to the extension and improvement of the service.

A NEW ENGLAND VIEW OF THE TELEPHONE SITUATION.

WHAT A RESPONSIBLE MANUFACTURER IS DOING—ESTIMATED INVESTMENT OF $8,000,000 IN OPPOSITION COMPANIES — HOW THE INDEPENDENT COMPANIES HAVE PROFITED — AN ENCOURAGING VIEW FOR THEM.

To the Editor of Electrical Review:

The writer has been very carefully digesting the contents of your supplement and other articles in a recent number of the Electrical Review, and makes the following suggestions, which may be of some value to you as bearing on the present situation.

We have had numerous letters from our clients during the last two or three days, showing that the independents are feeling worried as to the immediate future. It would seem to us to be only fair to state definitely, even at the risk of repetition, that the validity of the Berliner patent has not been in question, and that the opinion not only of the independent manufacturers, who, of course, are interested parties, but of some of the best patent lawyers in this country, is that the Bell people will be unable to sustain the Berliner patent in any way when a suit comes up for trial.

Inasmuch as we are occupying an independent position so far as any connection with telephone manufacturers is concerned, and as we desire and trust that we are on fairly good terms with all, we have been informed somewhat confidentially, so far as using names is concerned, by several of the most conservative, that they hold documentary evidence which gives them perfect confidence in their right to manufacture and sell transmitters. Of course, it would be perfectly natural for them to put on a bold front, even if they do not feel quite sure of their ground, but one case has come under our observation which should be cited and have considerable force along the line of inspiring confidence in the minds of those who are interested in independent exchanges, and also those who are contemplating entering into an investment of this nature in their locality. The case which we would cite is that of the most conservative manufacturer in this country, who is at the head of a company owning, so far as we can judge, more tangible property, which would be risked in case of defeat in a legal battle with the Bell people, than all the other independent companies put together. We may be mistaken in this statement, but we think not. The company we have in mind did not for years manufacture any transmitters, and, while selling a good telephone, would always bill the transmitter direct from the maker of the same, not feeling that they cared to take any chances. Within a few months they have manufactured and are selling transmitters of an excellent grade, and this action was based upon documents which the president of the company holds in his possession and which have been passed upon by one of the best patent attorneys in the country, who advises his client that it is perfectly safe to manufacture and sell the transmitters.

It may be well also to make a few suggestions as to the general telephone situation. The Bell people have nothing more than they have had since the expiration of the Blake patents. They have been unable to stem the tide which has rushed over the country, until there are about 1,000 independent exchanges, with an invested capital approximating $8,000,000 or $10,000,000. It is well known that in many places the established company has given free service for one year without being able to injure the local exchange, and it is also true that a surprisingly small percentage of these independent companies, with all the opposition brought to bear, have failed to make a good round profit on their investment, notwithstanding the fact that they have in many cases, owing to their ignorance of the business, purchased material and apparatus which was not adapted to their conditions, or which proved to be of very inferior quality.

Now, we would submit that if, holding the Berliner patent as they do now, the Bell people have been unable to make headway against the independent movement and have been unwilling to bring any suits on the validity of the Berliner patent—at least to push them to a finish—it would seem that they have a much more difficult problem to meet now that investors have found that there is a profit in local telephone exchanges, that they can connect one with the other until practically a long-distance service—so far as counties and portions of States are concerned—can be obtained, and also when they have a large amount of money invested in property which they are determined to defend.

Aside from the legal aspect of the case, and the question as to whether the Berliner patent can be sustained, is the fundamental condition upon which the telephone is based. As compared with the telegraph business, 90 per cent of which is transacted between one town and another, and which requires, in small places, but one, and even in large cities, comparatively few, stations, the telephone business is transacted between points in the same town to a large degree. Probably not 20 per cent of the subscribers to telephones in New York city have any considerable use for long-distance service, and many of those can easily step out to a long-distance office to transact their business. In view of these facts the telephone business in a given town is transacted by the citizens of that town between themselves; the rights of way, franchises and all privileges must be obtained from the authorities in that town, many of whom to-day are interested in the local telephone business. Should the Bell company endeavor to crush the independent business, it will be necessary to deal, not only with the manufacturers of telephone apparatus, but with the people themselves, and it would seem to be a pertinent question to ask what privileges the Bell people could obtain from the citizens of a town after they have ruined the business of the local company in that town. In such case franchises, rights of way, betterments of all kinds, and all privileges which are absolutely necessary, would be vastly more expensive than they are to-day.

We notice by a late number of the Electrical Review that in a western city already the council is charging a license of $5 per 'phone for each subscriber, and has also passed an ordinance prohibiting the Bell company from charging more than a fixed rate. This action in itself—which is perfectly feasible on the part of any town authorities—if pushed, would render the path of the Bell people a very thorny one.

These suggestions are not made in any spirit of bitterness, but in order that the hundreds of independent companies, whose officials are reading the Review, may get a fair idea of the advantages which they hold in their hands and the difficulties that the Bell companies will have in crushing the independent business. No doubt many investors will be frightened, as they have been during the last two or three years, and will await developments. Many established companies will hesitate to extend their lines, but the local telephone business is practically, and will always be, in the hands of the citizens, who have the power to grant or withhold authority in their own town, which authority is absolutely necessary to any telephone company attempting to construct or maintain a plant at that point; and this being the case, it would seem that the worst that can come, even if all that the Bell people are claiming can be sustained, will be some arrangement which will not in any way injure or depreciate the investments which have been made, and which will continue to be made, in this country. Subscriber.

Boston, May 20.

Electric Light Convention.

We give in this issue the complete programme of the coming convention of the National Electric Light Association. A large number of especially valuable and interesting papers are to be read, and the Electrical Review will publish them in a series, which will be a treat for our readers. Appearances indicate that the coming meeting will be the largest and most successful in the history of the association, and, held at Niagara Falls, surrounded by the very latest and best work of progressive electric industries, it will be in an atmosphere where ozone should be abundant and exert an enthusiasm-rousing effect on the members. We hope every member will bear this in mind and make every effort to attend, assuring him beforehand of a great gathering, a warm welcome and a meeting where he will learn much to his advantage.

TELEPHONE NEWS AND COMMENT.

The business of maintaining telephone connection between New York and Chicago, at the rate of $9 for five minutes' conversation, has been so profitable that, it is understood, connection between New York and Omaha is to be established, the rate being $14 for five minutes' use of the wire. This is another blow at railroad travel.

The Common Council, of Owosso, Mich., has granted the State Telephone Company a 30-year franchise, the rates to be $24 for business places and $18 for residences on five-year contracts, the company to furnish city 'phones at $15 a year. A bond of $2,000 must be furnished and the system completed by September 1. Consolidation with other companies is forbidden. No extra charge is to be made for talking with Corunna, the present charge by the Bell company being 25 cents.

The largest holders of Bell telephone stock are Theo. N. Vail, with 4,804 shares; T. A. Watson, 1,610; J. P. Morgan & Company, 2,996; Jackson & Curtis, 1,850; J. M. Forbes, 1,732; Wm. H. Forbes, 1,940; Zenos Crane, 3,100; W. N. Crane, 3,520; M. G. Bell, 1,664; Blake Brothers, 1,947; Arthur W. Blake, 1,465; Gardner Hubbard, 690; P. & A. Lowell, 2,996; F. F. Stanley, 1,642; J. H. Bowditch, 1,050; A. Cochran & Company, 1,125, and Esther F. Wright, 1,200. There are 6,600 stockholders, an increase during the year of 1,200. Mr. Vail, who is now the largest single holder, was the former general manager of the company, though not now active in the affairs of the company.

The committee of the Pennsylvania State Legislature that has been investigating the municipal affairs of Philadelphia at intervals for two years rendered its report last week. The first matter considered was the franchise of the Mutual Automatic Telephone Company, which was obtained in spite of strong efforts by two other companies to obtain similar concessions, although both of them were willing to pay considerable sums for the franchise, and the Mutual Automatic company paid nothing. According to the report, the committee found that proxies for voting the stock of the company had been signed by David Martin and C. A. Porter, although both of these men denied that they had anything to do with the company or its property. The committee recommends that legislation be enacted to stop the giving away of franchises, and to provide for more effective methods of investigation. The report also states that the attempt of the city of Philadelphia to manufacture its own gas has been a failure, and recommends the immediate sale or lease of the municipal gasworks.

THE INDEPENDENT TELEPHONE COMPANIES.

A CALL FOR A NATIONAL MEETING AT CHICAGO THIS WEEK.

The independent telephone exchanges of the United States are invited to send representatives to a general meeting, called in a circular letter sent out by Mr. J. E. Keelyn, president of the Western Telephone Construction Company, of Chicago. This letter, after alluding to the many telegrams received asking about the Berliner decision, makes the following announcement:

In order to set this matter clearly before the public, in order to bring harmony out of chaos, and to strengthen the general business, a meeting was held at the office of the writer yesterday, and he was advised to call a general meeting of all the independent telephone exchanges in the United States, to be held in the city of Chicago, Thursday, Friday and Saturday, May 27, 28 and 29. This is a short time in which to give notice, but prompt action is desired.

The Bell company, undoubtedly, will bring action on this Berliner patent, therefore a united policy will be beneficial.

The writer has therefore thought it best that the operating exchanges should get together in representative form, and determine upon a proper policy to follow and act in unison, and create an organization of a national character, which will tend to the mutual advantage of all, *not only upon this Berliner patent question*, but upon all general matters affecting the independent telephone companies.

It is imperative that you should be represented, and therefore if it should be impossible to be present, kindly advise the writer, or authorize some one to act for you in a friendly way. We want to make a good, strong showing, and go before the public in such a way that the whole people will see the importance of preventing the encroachments of the Bell telephone monopoly. Let us get together and do business and make the meeting a rousing success.

Very truly,
J. E. KEELYN, President.
Chicago, May 17.

GENERAL NOTES.

The New York & Philadelphia Traction Company is asking for proposals for masonry for part of the trolley line from Bound Brook to Somerville, N. J.

"Darrah's Street Railway Guide for Eastern Massachusetts" has appeared in a second edition. There is probably no other district in the world which possesses such a network and complete system of electric railways as eastern Massachusetts. A guide to these various railways is a necessity if their full advantages are to be enjoyed. The various cities and towns on 40 electric railways are indexed and tabulated in a convenient manner. The publisher of the guide, which sells for 10 cents, is R. H. Darrah, 81 Milk street, Boston, Mass.

THE

Stromberg-Carlson Telephone Mfg. Co.,

76 JACKSON BOULEVARD, CHICAGO, ILL., U. S. A.

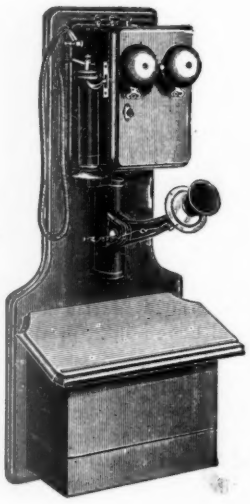
This Company owns letters patent granted to Alfred Stromberg and Androv Carlson, under sundry dates, covering Telephone Apparatus that infringes none and is second to none.

Full Equipment for Central Stations, also for House, Office, Factory, Police and Fire-Alarm Systems. Manufactured under our own patents from crude material.

TELEPHONES

— FOR —

Exchange, Factory and Private Lines.



We have just received an order from Persia for a complete

TELEPHONE EXCHANGE OUTFIT,

which proves that all the world appreciates a good Telephone.

DE VEAU & CO.,

Nos. 32 and 34 Frankfort Street, NEW YORK CITY.

A Statement Relative to the Telephone Situation.

Though the issuance of the Berliner patent is proper, the fact that the patent is invalid is so conclusive and definite, as based on the existing evidence, that we regret the general misapprehension of the subject and take advantage of the opportunity to offer protection to the users of the Connecticut Telephone & Electric Company's apparatus, and will defend at our own expense any suits brought against users of our apparatus.

The Bell Company has only a most empty victory in the recent Supreme Court decision, which has tended to bring to the surface more than SUFFICIENT EVIDENCE to give the independent telephone manufacturer new confidence as to the use of the microphone. While we have no fear that the Bell Company will bring suits for infringement, we believe that they will attempt to intimidate prospective purchasers of other than Bell apparatus, and we warn our customers to pay no attention to their empty threats.

We are manufacturing twenty types of telephone instruments covering all applications. In the construction of these instruments we have aimed to make only the highest grade of talking telephones, not competing in any way with cheap apparatus.

We are established not for to-day and to-morrow, but for a long time to come. At the present time we have thousands of instruments in use giving perfect satisfaction, and the indorsements of our apparatus are worthy of consideration.

The Connecticut Telephone & Electric Co.,

WESTERN OFFICE:
195 La Salle St., Chicago.
F. F. SAPP, Manager.

MERIDEN, CONNECTICUT.

NEW SWITCHBOARD PERFECTED.

The Connecticut Telephone & Electric Company has recently perfected a switchboard, the simplest in construction, quickest in operation, most efficient and radically new in principle.

One hundred drops will be placed in a space of fifteen inches, using no calling keys, switch levers or clearing-out drops; parties clearing-out through their own drops. The shutters are practically self-restoring, being reset at the same time that the plug is thrust into the spring-jack.

Descriptive matter pertaining to this switchboard will be ready shortly.

THE

Western Telephone Construction Co.

250 SOUTH CLINTON STREET, CHICAGO, ILL.

This company desires to state that it owns Letters Patents No. 521,461, granted to H. M. Fisk, June 19, 1894, covering the idea of mechanically restoring a switchboard drop by the insertion of the plug into the jack, a feature which has made the "Western" switchboard the most rapid, and at the same time the least complicated, of any on the market.

No. 561,335 granted to K. B. Miller, June 2, 1896, covering all details of a complete telephone system for large exchanges without the use of multiple jacks, and wherein the connection between any two subscribers is made by the use of but two pieces of connecting apparatus.

No. 579,299 granted to J. E. Keelyn and K. B. Miller, March 23, 1897, covering its new multiple telephone system for large exchanges. A switchboard which is manipulated with fewer movements on the part of the operator than any other switchboard in the world.

No. 581,350 granted to J. E. Keelyn, April 27, 1897, covering the means for mounting the magnets in a bi-polar receiver in such a manner that their adjustment is easy and absolutely permanent when once obtained.

And, other patents granted, and applications pending, covering its entire product. Notice is hereby given that parties infringing any of these patents will be promptly prosecuted.

In the past this company's motto has been "Live and let live." It has acted mainly on the defensive. It finds, however, that its rights have been trampled upon to such an extent that it will now begin an aggressive campaign, and show the general public that its aggressive policy will be as sound as its defensive one has proven itself to be.

This company again desires to assure the public that there is no ground for fear from the Berliner patent, provided a company of unquestioned responsibility stands back of the purchasers of telephonic apparatus. The recent Supreme Court decision simply declared that there was no actual proof of fraud on the part of the Bell Company—a Scotch verdict—(not proven).

The best combination that Independent Telephone Exchanges can form is a trade alliance with the Western Telephone Construction Company. Its guarantee is surest security upon patents. Its apparatus gives highest satisfaction in operation. Its customers are legally insured and commercially assured. The result must be success.

TAKE NOTICE: The Western Telephone Construction Company will not enter into any combination of telephone manufacturers upon patent suits. It is amply able to pay all expenses for itself and its customers without aid from others.

PERSONAL.

Mr. A. E. Kirby now represents the Paragon fan motor, with headquarters at 150 Nassau street, New York.

Mr. Geo. A. Mansfield, of the Michigan Electric Company, Detroit, made a brief visit to New York city last week.

Mr. Charles J. Mayer, of Mayer & Englund, Philadelphia, was a New York visitor last week. Mr. Mayer's firm handles electric railway material and has a very extensive business in this line.

Messrs. P. H. Hover, of the New York Insulated Wire Company, New York city; L. W. Serrell, of New York, and Murray Shipley, Jr., manufacturer of machine tools, Cincinnati, were recent visitors to Syracuse, N. Y.

Mr. Frank C. Mason, superintendent of police telegraph, Brooklyn, N. Y., has been elected president of the Aurora Grata Club. This is one of the strongest masonic organizations in the East, and possesses a fine club-house on Bedford avenue.

Mr. S. M. Hamill, the general manager of the Brush Electric Company, was a brief visitor in New York city last week. Mr. Hamill has been the responsible manager of the Brush company for some ten years past, and is one of the most widely known and popular gentlemen connected with the electrical manufacturing field.

Mr. Frank W. Hawley, chairman of the committee to receive and entertain Governor Morton at the opening of the Electrical Exposition last year, and whose energetic efforts in connection with the gun firing and the sending of messages around the world contributed so largely to the success of the exposition, has arrived in the city from California. Mr. Hawley says that San Francisco is still talking of the excitement produced on that occasion, and also says that there is a strong feeling in that city in favor of an electrical exposition there next year.

WESTERN NEWS NOTES.

On June 1 next, Mr. C. H. Wilmerding, for the past four years general superintendent of the Chicago Edison company, will sever his connection with that company, and open an office at 1519 Old Colony Building. Mr. Wilmerding enters the engineering field backed by years of practical experience in the various branches of central station and isolated lighting, railway and transmission plants, which will tend to make his work doubly reliable and valuable to all who may retain his services.

Mr. J. G. Nolan, the energetic representative of the Western Telephone Construction Company, Chicago, returned from a trip through the South last week, bringing with him several nice contracts for telephone exchange equipments, two of them for places in Alabama, two in Missouri and another with Mr. F. L. Hawley, of Florence, Ala. It may be merely a coincidence, but, since the issuance of the Berliner patent decision, the company's daily average of orders received has been greater than any time previous.

The Western Electric Company, Chicago, is rearranging its city sales department and offices, so as to better accommodate its constantly increasing city trade. While advantageous location has, without doubt, considerable influence upon a retail business, it is nevertheless a fact that the right kind of goods, sold at the right prices, will generally draw the trade. This is well shown in the case of the Western Electric Company, whose city trade has gradually increased to such an extent as to make frequent changes in the way of additional salesroom, as above mentioned, necessary.

C. M. Turnquist, Chicago, dealer in general electrical supplies, recently completed his fifth year in business. Commencing in 1892 with a small stock of supplies—intended, more especially at that time, to cater to the wants of the smaller contractors in Chicago—Mr. Turnquist, through his sagacious business methods and by a liberal use of printers' ink judiciously applied, has gradually built up a large and profitable mail-order business, covering not only the United States and Canada, but extending to all parts of the civilized world, as shown by original orders from such places as Chinanfu, China; Calcutta, India; Ceara, Brazil; Abbottsford, Victoria, Australia, and many other distant lands. Mr. Turnquist has just issued a new edition of his general catalogue, which he sends free to any address.

C. E. K.

Chicago, May 22.

Annual Meeting of the New York Electrical Society.

The New York Electrical Society held its annual meeting May 20. The officers elected were: President—Dr. M. I. Pupin. Vice-presidents—Gano S. Dunn, Max Osterberg, W. W. Ker, A. L. Riker, Willard E. Case, H. B. Coho. Secretary—George H. Guy. Treasurer—Henry A. Sinclair. The society has now 397 members.

Mr. H. Barringer Cox lectured on "The Direct Conversion of Heat Into Electricity", showing the present condition of the practical relations between heat and electricity in regard to the direct conversion of the energy of fuel into current. Mr. H. Barringer Cox, who for many years has been working on the developments of thermopiles, gave a very interesting lecture, which he illustrated with three of his thermo electric generators, using gas flame as the source of heat. These generators consist of a number of thermo-electric couples of ingenious construction, grouped circularly around the flame.

The elements are incased in fire-resisting clay, backed up by a metal case, which forms the water jacket. From this small contrivance, which is about half the size of a silk hat, sufficient output is obtained upon the consumption of two and one-half feet of gas per hour to run a small ordinary fan motor, or to operate such devices as electro-medical circuits, telegraph keys, X-ray apparatus, gongs, etc. There was an animated discussion, which was participated in by Dr. Emery, Dr. Crocker, Dr. Pupin, and Messrs. Mailloux, C. S. Bradley, Sachs, H. W. Leonard, Lieb, and others. Mr. Gano S. Dunn made the readings in testing the operation of the thermopiles, as there was a brisk dispute as to what the theoretical and the actual output of such devices ought to be.

Mr. Wessels and the Standard Air-Brake Company.

Mr. E. J. Wessels, general manager of the Standard Air-Brake Company, of New York, will sail for England on the "Majestic" on June 2 in the interest of his company. It has been almost entirely due to his vigorous and unremitting efforts for nearly three years that

MR. E. J. WESSELS.

air-brakes have been accorded a strong footing among the trolley railway companies. Under his management the business has grown most satisfactorily, and now that he is going over for a few months to establish and cultivate a foreign trade, it is hoped his success will be even more marked. We present an excellent likeness of this courtly gentleman, and we bespeak for him a cordial and profitable reception abroad.

The decision of Justice Beach of the Supreme Court is in favor of the Metropolitan Traction Company on the proposed introduction by that company of the underground trolley system on Sixth and Eighth avenues, this city. The decision holds that for a mere change of motive power the consent of the local authorities is not necessary; that the Board of Electrical Control has not jurisdiction over electric railways, and that the old contract in the charter of 1851, allowing the city to buy the property at cost and 10 per cent added, is dead and worthless. The cases are likely to be carried to the Court of Appeals, but we will be mistaken if that tribunal will find justification for destroying important vested rights which have remained undisputed for nearly half a century.

A Compliment from an Authority.

In the last issue of the *Fourth Estate*, of New York—a "newspaper for the makers of newspapers", ably edited by Mr. Ernest F. Birmingham—appears the following complimentary reference to the ELECTRICAL REVIEW, which is a recognition of enterprise that, very naturally, is highly appreciated in this office:

In its issue of May 12 the ELECTRICAL REVIEW of New York exemplified in a striking manner the use of daily newspaper methods by a high class technical journal. The famous Berliner telephone suit, which for over a year had been before the United States Supreme Court for final adjudication, was decided on Monday, May 10, at 12.15 P. M. This is the day on which the last form of the ELECTRICAL REVIEW goes to press.

The paper was made up as usual and the Berliner matter was handled in a 4-page supplement, remarkably complete in its detail. The story included a two-column abstract of the court's opinion sent by the REVIEW'S regular Washington correspondent; opinions by telegraph from the independent telephone manufacturing companies; a history of the litigation, an editorial comment on the decision, besides many facts of interest relating to the telephone situation in general.

On Tuesday morning, May 11, at 10.30 A. M., the ELECTRICAL REVIEW received by wire, over the Postal lines from Chicago, copy for a full-page advertisement to be published in its supplement. This was rushed through, and by 3.30 P. M. the same day copies of the paper and supplement were in the hands of its readers.

The whole edition, including the foreign list, was mailed at the usual hour. Not a moment's delay was experienced by this enterprising journal in handling the biggest story of the year in its special field promptly and with detailed thoroughness. Such enterprise among class journals is as unusual as it is creditable, and Editor Charles W. Price is certainly warranted in taking pride in the brilliant accomplishments of the ELECTRICAL REVIEW.

There were but three newspaper men who were permitted, by the way, to read the court's opinion on the day it was handed down. These were the Washington representative of the Associated Press, a reporter for the Washington *Evening Star* and the correspondent of the ELECTRICAL REVIEW.

Des Moines Will Buy the Plant.

At a city election in Des Moines, Iowa, on the 17th instant, the plan for municipal ownership of an electric light plant was carried by a vote of three to one in a vote of a little over 5,000. Under the proposition submitted by McCaskey & Holcomb Company, of Springfield, Ill., the city pays an annual rental of $55,000 for a period of a little over six years, at the end of which time the contractors will turn the plant over to the city for $1.

Train robbers will hereafter have an especial respect for superintendent F. L. Dame, of the Tacoma Railway and Motor Company, Tacoma, Wash. One of them stopped and boarded a car, and was successfully robbing the frightened passengers, the other day, when Superintendent Dame put in an appearance and began bombarding the robber, and, finally, shot him to death, but was himself wounded. Examples like this are rare, and the plucky superintendent deserves the praise of all.

THE SYNCHRONOGRAPH—A NEW METHOD OF RAPIDLY TRANSMITTING INTELLIGENCE BY THE ALTERNATING CURRENT.

ABSTRACT OF A PAPER READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, APRIL 21, 1897, BY A. C. CREHORE AND G. O. SQUIER.

(Concluded from page 237.)

The brushes pass off from and on to the paper, thus making and breaking the circuit, at the instant corresponding to the points in the current wave, Fig. 1, when the alternating current is naturally zero. The tape T passes over a wheel P geared to the generator shaft, so that for one revolution of the armature, the tape advances a fixed distance. If the generator has 10 poles, this fixed distance on the tape corresponds to

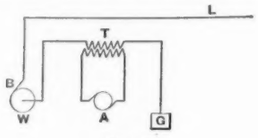


FIG. 8.

five complete waves or 10 alternations or semi-cycles of the generator current. One-tenth of this fixed distance corresponds to one alternation or semi-cycle of the current, and may be taken as the unit of distance in perforating the tape. If, therefore, a hole is made in the tape equal in length to this unit, and the brushes B and B′ happen to pass off from the paper so as to meet through the hole at the instant the current is naturally zero, then they will pass on to the paper again, breaking the circuit at the next following instant when the current is also naturally zero, since the length of the hole corresponds to one semi-cycle of the current.

In practice it would probably not happen that the brushes were at first so situated as to pass off from and on to the paper at the instant the current is zero. In this case a succession of sparks appears, one each time the brushes pass on to the tape, and this spark either increases or decreases in intensity, according to the direction moved; but at regular intervals, equal to the unit mentioned, it disappears.

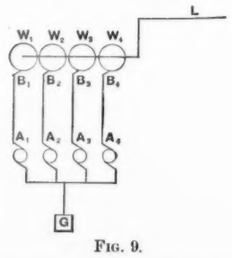


FIG. 9.

This position for no sparking is easily found by trial, and the brushes once adjusted always so remain, and since there is no sparking, it is possible to use high electro-motive forces upon the line. This method of operating is not affected by the speed of the generator, since the transmitting device is always in synchronism with the generator.

An example, giving the data from an early experiment, will illustrate. A Fort Wayne 10-pole alternator giving a potential at its terminals of 1,000 volts was transformed to about 300 volts. The end of the shaft E, Fig. 6, of the generator carries a small pinion, which engages the gearing G, and revolves the wheel P once in every 18.4 revolutions of the armature. This makes the one-one-hundred-and-eighty-fourth part of the circumference of the wheel P correspond to one semi-cycle of the current. The circumference of the wheel was about 100 centimetres, and the length of a unit, therefore, one-one-hundred-and-eighty-fourth of this, or .54 centimetres.

A tape, paper tape, had its two ends joined so as to make a continuous belt. The tape passed from the large wheel P to the loose pulley Q mounted upon a base-board A, and under the guiding pulley attached to the support S which controlled the tape, immediately before passing the brushes B B′.

Having obtained the length of a unit on the wheel the tape is first divided into these equal units, and then the proper units are cut out to form a message. The units which are not cut out form the dots and dashes. The secondary circuit, which includes the line, was brought to the transmitter. This experiment is shown in Fig 8, where A represents the alternator, T the transformer, B the brush bearing upon the transmitting wheel W, and L the line. Another diagram, illustrating how the method may be used with currents of the same or different frequencies, is given in Fig. 9, where several generators A_1, A_2, A_3, etc., are represented upon the same shaft, and each is connected to a separate brush B_1, B_2, B_3, etc., bearing upon the wheels W_1, W_2, W_3, etc., upon a common shaft and connected to the line. By placing the insulating papers in the proper positions upon the wheels, it becomes possible to transmit in succession, first a current of one frequency and then of another, or of all at the same time.

A record obtained by the use of tape is shown in Fig. 10, where the sentence "one wire will do work of ten" was transmitted on August 10, 1896. This message was sent at the rate of 337 semi-cycles of current per second, thus requiring about half a second altogether.

FIG. 10.

Since the speed of transmission depends upon the frequency of the alternating current, the limit of speed is determined by the particular alternator used. In the above example the alternator available was designed to run at a speed of about 1,600 revolutions of the armature per minute, corresponding to a frequency of 133, or 266 alternations per second. To increase the speed of transmission this alternator was run as high as 2,400 revolutions per minute, beyond which it was thought dangerous to go. This corresponds to a frequency of about 200 complete cycles or 400 alternations per second.

The speed of armature used was 2,180 revolutions per minute, corresponding to 1,090 semi-cycles per second, or 65,400 per minute, or a frequency of 545. No difficulty was experienced in sending and recording messages at this rapid rate, which corresponds to between 3,000 and 4,000 words per minute.

This alternator, shown in Fig. 13, is in fact four alternators upon the same shaft, having 18, 22, 26 and 30 poles, respectively. To obtain the highest speed, the 30-pole machine was used, and the transmitting wheel geared to the shaft as with the 10-pole alternator. The speed of armature used was 2,180 revolutions per minute, corresponding to 1,090 semi-cycles per second, or 65,400 per minute, or a frequency of 545. No difficulty was experienced in sending and recording messages at this rapid rate, which corresponds to between 3,000 and 4,000 words per minute.

THE POLARIZING RECEIVER.

This instrument was designed for a military chronograph, is known as the polarizing photo chronograph, and is shown in Fig. 11. A sensitive photographic plate revolves in the wheel W, driven by the motor M. A powerful beam of light from the arc lamp A is condensed by the lens L, and passes through the polarizer P, a Nicol prism, thence through the glass tube T, containing liquid carbon bisulphide and surrounded by a coil of wire, through the analyzer A, a second Nicol prism, and is finally passed through a second lens L′ to focus the beam upon the horizontal radial-slit in front of the moving sensitive plate. In its operation, the analyzer A is rotated until the light is completely extinguished, when no current is passing around the tube T. The coil is in circuit with the line, and the closing of the circuit at the transmitter thus sends a current around the tube, and light immediately appears upon the camera slit. This is accomplished instantly upon closing the circuit without involving the motion of any material thing. Upon breaking the circuit the light immediately disappears, and its coming and going is easy to read.

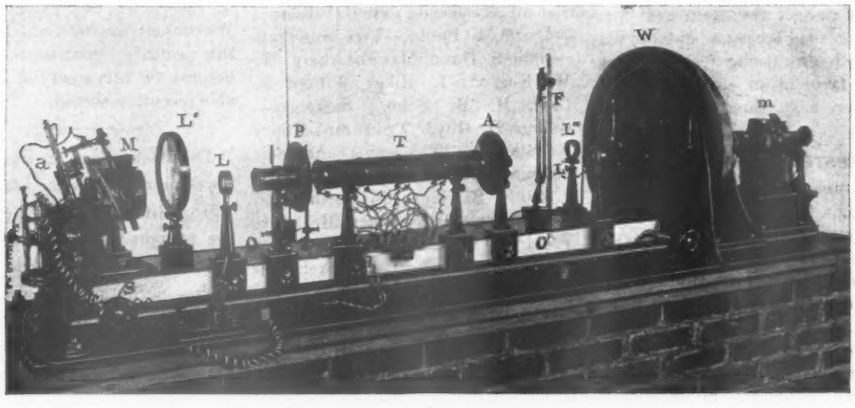


FIG. 11.—THE POLARIZING PHOTO-CHRONOGRAPH.

W, Wheel Holding Photographic Plate driven by Motor; F, Arc Lamp; P, Polarizer; T, Tube; A, Analyzer.

THE CHEMICAL RECEIVER.

In a practical form of receiver, it is an advantage to have the messages received in such form that they are ready for immediate use, and this is the case with the chemical receiver, to which reference has already been made.

If a direct current is used, no record appears when the current is in one direction, and it does appear when the current is reversed. If a second needle is substituted for the plate electrode, the record appears on one side of the tape for a direct current and on the other side for the reversed current.

If the two needle electrodes are placed side by side upon the tape, a record will appear at one needle for a direct current and at the other for the reversed current.

By receiving with two needles side by side all the alternations are recorded. The record then appears as two parallel lines of marks having the maximum intensities in one line opposite the spaces in the other.

If then an uninterrupted line of marks can be received in one line at the same time that a message is being received in the other, this uninterrupted line can be used for a second message entirely independent of the first. The next experiment accomplished this, and it is now possible to use the same line to send two entirely independent messages in the same direction at the same time at a high rate of speed.

To manifold, all that is necessary is to attach to one terminal, instead of a single needle, as many needles as the number of copies desired.

It is of interest to inquire what effects a system of telegraphy capable of sending continuously 3,000 words a minute would have on the existing methods. To take a single example of the business between New York and Chicago, where about 40,000 letters are carried daily, it would require but two lines in continuous operation to handle the entire business. At present it takes three days to receive a reply by mail between New York and Chicago. This transmission by machine telegraphy could be accomplished easily the same day. It is thought that an effect of this would be to increase business transactions to such an extent that the total volume of intelligence transmitted would be augmented, rather than to diminish the business now done by existing methods.

The class of business which such a system would probably at first obtain would be the less urgent telegraph business of greater volume, such as

the Associated Press dispatches and newspaper press reports.

It would be to the interest of such a company to seek that class of less urgent business now done by correspondence, rather than the class handled by the present telegraph

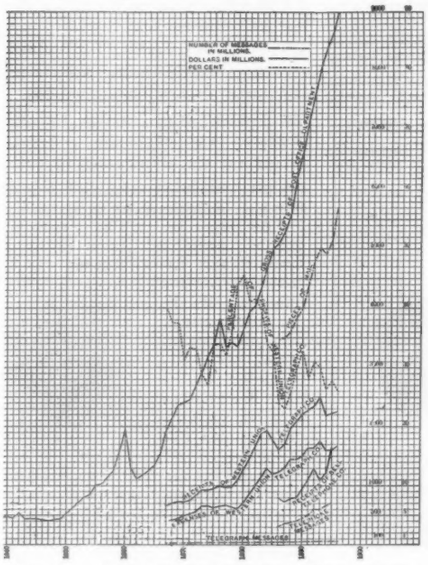


FIG. 12.—"THE SYNCHRONOGRAPH"—ESTIMATE OF MESSAGES AND THEIR VALUE.

companies, where the highest speed of delivery is expected. If one trunk line becomes established between large business centers, it will draw business from a surrounding area. For instance, if a line were established between New York and Chicago, and a person in Albany desired to communicate with Chicago or points beyond, it would be quicker to send the letter to New York for transmission over the trunk line to Chicago, and then by rail to its destination, than to send directly by rail from Albany. With a few trunk lines in successful operation it would not be long before they would be multiplied.

The telegraph line of the future will comprise substantial poles carrying a few copper wires worked to their full capacity for transmitting electric signals. The cost of maintenance of such a line when once constructed will be little more than for an ordinary iron wire now used, while its carrying capacity for intelligence at 3,000 words per minute simplex will be about equal to 160 wires used for hand transmission simplex. By duplexing the line, the carrying capacity is doubled and becomes 6,000 words per minute, which is about equal to 160 wires worked duplex, or to 80 wires worked by hand quadruplex.

It is thought that the influence which the inauguration of a telegraph letter system would have upon the existing telegraph and telephone business would be to increase rather than diminish it. Each of these services has its own special field of usefulness but little affected by the others. A new field would be occupied rather than an old field supplanted. The present telegraph and telephone would still have their natural field of operation, even though the best hopes for a telegraph letter service are realized.

The Fessenden X-Ray Machine.

We present a view of a new type of apparatus for practical workers in the field of the Roentgen rays. The devices are all contained in a handsome cabinet with the wiring and working parts concealed, except the X-ray tube, its adjusting arms and flexible wires. Neatness and convenience are thus insured to the user, and in a physician's office it is always ready for instant use. The jointed-tube holder, fixed as it is to the cabinet, is a striking feature of convenience, allowing the tube to be held at any angle and in any position desired, only needing the tightening of a few thumb-screws to secure it reliably wherever set. This permits the patient or subject to assume a comfortable position. The makers adopt a special form of the ordinary induction coil and condenser, which gives relatively great pressure and quantity. The coil is placed vertically, and the primary and secondary are separably attached with an intervening rubber insulating tube. In case of damage to either, it can be readily removed and repaired, or a new coil substituted at slight cost.

All the regulating and starting

THE FESSENDEN X-RAY MACHINE.

apparatus are together, and can be manipulated by the operator without moving from his position. By means of a special safety device, the amount of energy allowed to traverse the tube can be regulated and limited to the capacity of the tube. The makers furnish fluoroscopes made up with either barium-platino-cyanide or calcium-tungstate, but prefer to furnish the former. They also furnish a tube of special design.

The outfit is made in three sizes, for six-inch, eight-inch and 12-inch spark, respectively, and for direct connection to 110-volt and 500-volt continuous currents, or for use with storage battery; also for direct connection to 100-volt alternating current, through special commutator, to give direct current in the tube.

The 12-inch machine is intended to give results similar to those obtained from the famous machine constructed by Professor Fessenden for the Academy of Art and Science, Pittsburgh, which penetrated four inches of armor-plate. The apparatus is placed on the market by the Fessenden Manufacturing Company, Pittsburgh, Pa., and Electrical Exchange, New York. The Fessenden company's machines were the cause of much favorable and practical comment at the recent convention of railroad surgeons held in Chicago, where the machines operated continuously, and gave great satisfaction.

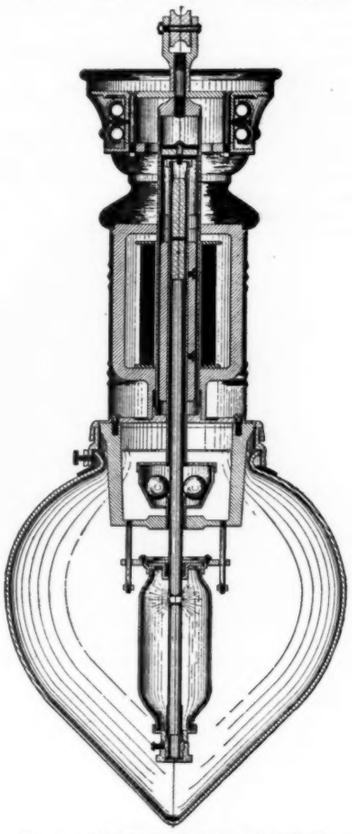


FIG. 1.—NOWOTNEY INCLOSED ARC LAMP.—SECTIONAL VIEW.

The Nowotney Inclosed Arc Lamp.

This lamp, introduced by the Nowotney Electric Company, Cincinnati, Ohio, presents some rather striking features. Fig. 1 illustrates its entire mechanism, which is very simple, and the details have evidently been well designed and worked out. In this lamp there are no rods, chimney, clockwork, gear-wheels, springs, side-rods, nor outer globe-stand to cast shadows. The carbon is gripped directly without the intervention of any carbon rod; the clutch is composed of four porcelain balls, maintained in position by a retaining receptacle, and performing all the functions of a ball-bearing, arc-maintaining device. It is impossible for the carbon to slip, except at the proper time when feeding takes place.

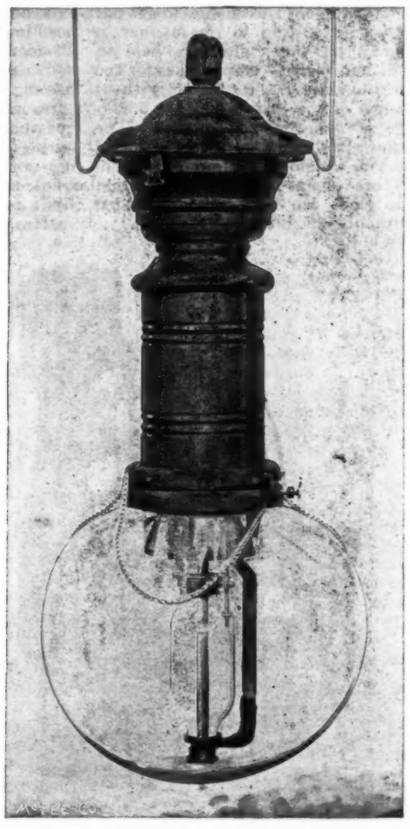


FIG. 2.—NOWOTNEY INCLOSED ARC LAMP.—WEATHERPROOF TYPE.

It is ornamental in appearance for both interior and exterior service.

FIG. 3.—NOWOTNEY INCLOSED ARC LAMP.—INDOOR TYPE.

The outdoor lamp is fully weatherproof, preventing any moisture from

getting into the mechanism. It is furnished to consume four amperes, four and one-half amperes and five amperes at 80 volts across the arc, with 110 volts on the line.

The general arrangement of this lamp is such that it is extremely easy to recarbon and take care of it. There are no adjustments to get out of order. Owing to the manner in which the inner globe is held in position, there is ample room for the glass to expand and contract without danger of it breaking, and the breakage of inner globes is rare. The outer globe is supported by a ring at its top, which when lowered is held by three chains in such a manner that the globe can be raised or lowered without detaching it.

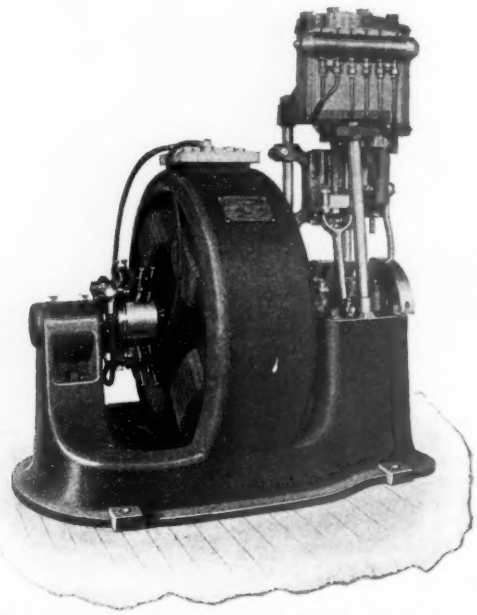


FIG. 1.—ELECTRIC LIGHTING FOR SHIPS—RUSHMORE DYNAMO AND ENGINE.

Electric Lighting and Other Apparatus for Ships.

Although electric lighting is now in extensive use on shipboard, it is only in the last few years that great progress has been made, and this was owing to the fact that apparatus which proved very satisfactory on land, where conditions were favorable, was utterly unsuited for use at sea. This is particularly true of the generating machinery, and most of the plants, even to this day, consist of some common form of dynamo mounted on a make-shift bed plate and connected with a clumsy coupling to almost any make of engine, which is rarely ever of a type or design suited for such use, and they generally presented an ugly appearance and gave constant trouble from vibration of the ship and breakdowns.

The Rushmore Dynamo Works, of Jersey City, who have for years made a specialty of marine equipment, have brought out a line of direct-connected sets, or steam dynamos, in which every detail has been perfected to meet the exacting requirements when working in cramped quarters, in hot, damp engine rooms, where the temperature is often beyond human endurance.

Fig. 1 shows one of the new generating sets of 30-kilowatt capacity, built in the same frame with their new type engine of 25 horse-power, at 350 revolutions per minute. The magnet is a continuous steel casting, with form-wound coils. The armature is of the iron-clad type, wound with continuous copper bar on the new wave system, insulated with mica, and is guaranteed against short-circuit when saturated with sea water. There is no shaft from the rear of the armature, but the engine flange couples directly to the armature-core body, insuring perfect alignment. The dynamo has but one bearing, which is self-oiling. The engine is of an entirely new design, with the frame of steel forgings, highly finished. The crank shaft with counter weights and coupling are forged in one piece, machined all over and drilled hollow. The coupling is forged with the shaft bolts directly to the armature and the bearings are extra large to carry the extra weight. The automatic cut-off governor is very powerful, and regulates within one per cent. All wearing surfaces are lubricated from a single-tank oiler, with sight feeds leading to every wearing surface. Machines are so perfectly balanced that they will run at double the rated speed without vibration, and may be mounted on bulkhead or grating without foundation.

FIG. 2.—NEW RUSHMORE BELTED DYNAMO.

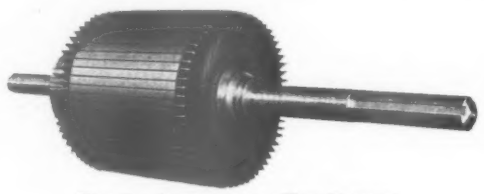


FIG. 3.—ARMATURE OF NEW DYNAMO.

Fig. 2 shows the new Rushmore belted generator of 600 lights capacity at 900 revolutions per minute. Fig. 3 shows the new type armature. The output of these new machines is said to be double that of any other make for the same weight, while the speeds and increase of temperature are much lower, and it is difficult to see how any further improvement can be made. These machines are now being built in sizes up to 150 kilowatt.

As is well known, the Rushmore works build a complete line of high-power projectors, and they now have a complete line, ranging in size from 10 inches to 72 inches diameter, taking from five to 300 amperes; and they are now building a number of 30-inch naval projectors, with electrical distant-control mechanism, for the large battleships.

Fig. 4 shows one of the latest type projectors, with parabolic lens, as used on the transatlantic liners. The Rushmore works have the only lens-making plant in the country, and they have recently completed a magnificent machine, weighing several tons, which will grind lenses up to six feet diameter with an accuracy heretofore considered impossible, and they will shortly complete a 72-inch light for long-distance signaling, which will consume a current of 300 amperes.

The American Institute of Electrical Engineers.

At a meeting of the executive committee of the institute on Tuesday, May 18, the following associate members were elected:

William C. Banks, electrician, Gordon-Burnham Battery Company, 82 West Broadway, New York city.

Edward C. Clement, assistant examiner, electrical division, United States Patent Office, Washington, D. C.

A. Davidson, cable engineer and electrician, Central & South American Telegraph Company, Lima, Peru.

Constant de Redon, consulting engineer, 27 Thames street, New York city.

Sidney Hosmer, superintendent underground cable department, Boston Electric Light Company, Ames Building, Boston, Mass.

Carl Kinsley, teacher of electrical engineering, Washington University, St. Louis, Mo.

John Neilson, superintendent of interior wiring department, Larchmont Electric Company, Larchmont, N. Y.

Albert S. Richey, electrician, Citizens' Street Railway Company, 403 West Adams street, Muncie, Ind.

The following associate members were transferred to membership: W. W. Nicholson, general superintendent Central New York Telegraph and Telephone Company, Syracuse, N.Y.; R. E. Richardson, electrical engineer, Chicago, Ill.; Edward B. Rosa, professor of physics, Wesleyan University, Middletown, Ct.

The annual business meeting of the institute was held at 12 West Thirty-first street, New York city, and was called to order by president Louis Duncan at 4 P. M. The counting of the ballots by Mr. Hamilton and Dr. Pupin, who were appointed tellers, resulted in the announcement of the election of the council ticket as follows:

For president, Dr. Francis B. Crocker, of New York city. For vice-presidents, Dr. A. E. Kennelly, of Philadelphia, Pa.; Mr. Chas. S. Bradley, of New York city; Prof. Dugald C. Jackson, of Madison, Wis. For managers, Dr. Alexander Macfarlane, of South Bethlehem, Pa.; Mr. Gano S. Dunn, of New York city; Mr. W. F. C. Hasson, of San Francisco; Mr. Herbert Laws Webb, of New York city. For treasurer, George A. Hamilton, of New York city. For secretary, Ralph W. Pope, of New York city. The officers whose terms have not expired are: Vice-presidents, Chas. P. Steinmetz, of Schenectady, N. Y.; Harris J. Ryan, of Ithaca, N. Y.; Wilbur M. Stine, of Chicago, Ill. Managers, Chas. F. Scott, of Pittsburgh; Bion J. Arnold, of Chicago; Carl Hering, of Philadelphia; Cary T. Hutchinson, John W. Lieb, Jr., and F. A. Pickernell, of New York city; Wm. L. Puffer, of Boston, and L. B. Stillwell, of Niagara Falls.

The reports of council and treasurer were presented and accepted. A total membership of 1,073 was announced, and a treasurer's balance of $1,284.06, with expenditures during the year of $8,909.36.

The report of the committee on a new design for the institute badge, which had been referred to this meeting by the executive committee, was taken up and thoroughly discussed, resulting finally in the adoption of the new design recommended by the committee, of which Dr. S. S. Wheeler was chairman. Arrangements for the withdrawal of the old design and substitution of the new one will be made at an early date.

The paper on "The Synchronograph", presented April 21 by Dr. Crehore and Lieut. Squier, was then taken up for discussion. Mr. F. W. Jones opened the discussion, which was participated in by Dr. Kennelly and Mr. Delany. A paper on "The Application of Hyperbolic Analysis to the Discharge of a Condenser", was presented by Dr. Macfarlane. Owing to lack of time, discussion was postponed until the general meeting, July 26.

NEW BADGE OF A. I. E. E.

The announcement by the tellers of the election of Dr. Crocker was greeted with hearty applause, and the president-elect was escorted to the chair by Mr. W. J. Hammer and Dr. M. I. Pupin, and briefly acknowledged his appreciation of the honor bestowed upon him.

At 7 P. M. the meeting adjourned, and the members immediately reassembled at the "Arena" restaurant, where arrangements had been made for the annual dinner, under the direction of Mr. Herbert Laws Webb, chairman of the committee on papers and meetings, and Mr. T. C. Martin. Although a sudden increase of about 50 per cent of the number of guests necessitated the laying of 93 covers, the overflow was provided for, and the event passed off pleasantly under the skillful guidance of Toastmaster Martin. Toasts were responded to by Dr. F. B. Crocker, Mr. F. W. Jones, Dr. M. I. Pupin, Dr. C. E. Emery, Dr. A. E. Kennelly, Mr. Ralph W. Pope, Mr. J. W. Lieb, Jr., Mr. Herbert Laws Webb, Mr. Nelson W. Perry and Mr. Joseph Sachs.

FIG. 4.—THE RUSHMORE SEARCH-LIGHT.

The exercises were interspersed with instrumental and vocal music by Mr. George Heli Guy and Mr. Charles McL. Paine. Mr. Guy played a waltz of his own composition, which he dedicated to the American Institute of Electrical Engineers.

ON THE DESIGN OF X-RAY TUBES.

BY A. A. C. SWINTON IN THE LONDON "ELECTRICIAN".

During the year that has elapsed since Mr. Herbert Jackson first applied the focus form of Crookes tube to the production of X rays, the writer, assisted by Mr. J. C. M. Stanton and Mr. H. Tyson-Wolff, has made numerous experiments, with the object of producing more reliable, durable and effective tubes than those of the ordinary commercial forms.

Experiment having shown that with the ordinary tubes the quantity and penetrative value of the X rays produced were considerably increased by employing a higher degree of electrical excitation, attention was first devoted to designing tubes which would stand, without deterioration, prolonged working with the full power of a 10-inch Rhumkorff coil, fitted with a mercury contact breaker. In order to render the tubes suitable for this amount of power, it was found necessary to make the stems supporting both cathode and anode of considerable length, so as to obviate overheating and cracking of the glass at the terminals, and also in order to keep the external terminals a considerable distance apart and prevent discharges taking place between them over the exterior surface of the glass.

Another difficulty was experienced in the overheating of the platinum anti-cathode, which, when subjected to the full power, was found frequently to become white hot, when it often became deformed, and not seldom actually fused. This overheating of the platinum anti-cathode was found to have the further disadvantages of causing much blackening of the interior of the bulb, and also of causing, in process of time, considerable variation in the vacuum, which frequently became so high that no discharge could be got to pass at all.

In order to avoid this overheating of the anti-cathode, it was found sufficient to mount the ordinary small disk of platinum upon a considerably larger and thicker disk of aluminum, say about one inch in diameter and 0.25 inch in thickness, the platinum being tightly wedged and riveted in a shallow circular depression turned out of one face of the aluminum disk. This arrangement prevents the platinum from attaining an excessive temperature, owing to the considerable radiating surface of the aluminum, and its considerable mass and high specific heat requiring a long time to warm it to any high degree. The tubes take longer to exhaust in the first instance, but are much more permanent, as not only is all danger of melting the platinum avoided, but also the difficulty experienced by reason of the red-hot platinum occluding the residual gas, and thus in time materially increasing the vacuum. In addition, the platinum having only one surface exposed, and never getting very hot, the tubes do not blacken so quickly.

Many experiments were also made with anti-cathode surfaces other than platinum, but though many metals, as, for instance, aluminum, were found to answer very well and to give photographic results quite equal to platinum, provided longer exposures were given, still platinum undoubtedly gave the greater quantity of X rays, as measured both by the time required to produce a fully exposed photograph, and also by the brilliancy of a fluorescent screen. Silver was found to give results almost as good as platinum in all respects, but it has the disadvantage of rapidly blackening the interior of the tube.

In order to discover whether large cathodes had any advantage over small cathodes, many tubes were constructed having cathodes varying in diameter from 2.5 inches down to 0.125 inch, with the result that there appears to be no advantage in making the cathode surface larger than it must be in order not to get unduly hot under the action of the electrical discharge. Very large cathodes were further found to have the disadvantage of making the tubes exceedingly difficult to exhaust, while their employment also necessitates much higher vacua in order to obtain X rays of any desired penetrative value. A good polished surface for the cathode was found of great importance in order to produce accurate focusing and, consequently, sharp definition, and it was also found that if the cathode is too small for the strength of the discharge, its surface becomes destroyed and roughened by some process which gives results analogous in appearance to pickling in acid. With the full power of the 10-inch Rhumkorff coil, cathodes of less than 0.375 inch diameter were for this reason found inadvisable, as they became very hot and rapidly lost their polish. The exact radius of curvature of cathodes does not appear to be a matter of much importance, but it may be mentioned that, with cathodes varying from 0.375 inch to 1.125 inch in diameter, a radius of curvature of 0.75 inch was found to give good results. In order to avoid waste of energy and heating of the glass by cathode rays coming off at the back of the cathode, it is desirable that the cathode should be arranged with its periphery near to, but not touching, the glass of the tube, or to make the space behind the cathode very small, the object in either case being to keep the whole of the space in the rear of the cathode in a negatively charged condition.

As the penetrative value of the X rays produced by any given tube depends very largely upon the exact degree of exhaustion, various arrangements have from time to time been suggested and tried for the purpose of readily regulating the vacuum. One obvious plan is to keep the tube permanently attached to the mercury pump, so that a little air can be pumped out or a little let in whenever it is found necessary. Another arrangement is to place some material, as, for instance, caustic potash, which is capable of absorbing air and giving it out again when warmed, in a small pocket or annex to the tube, which can be heated by means of a spirit lamp, and the vacuum reduced as occasion requires. This, however, as also the ordinary plan of heating the whole tube by means of a spirit lamp or Bunsen burner, so as to drive off into the interior of the bulb the gases condensed upon the glass, are at best only makeshift expedients, which, though capable of good effect in the hands of skilled experimenters, are not permanent in their results or adjustable with sufficient accuracy to be really satisfactory for practical application in surgery and such like.

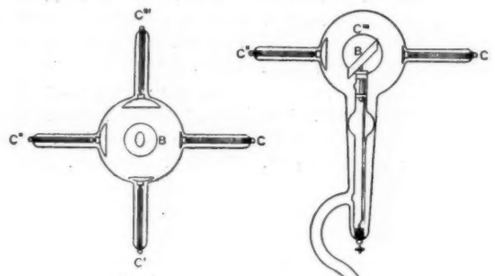


FIG. 1

FIG. 2

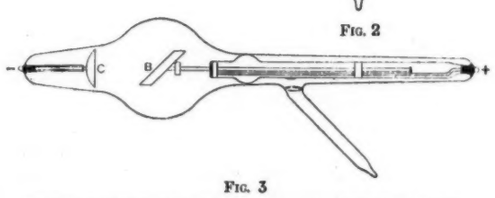


FIG. 3

DIAGRAMS ILLUSTRATING MR. A. A. C. SWINTON'S PAPER, "ON THE DESIGN OF X RAY TUBES."

Under these circumstances the writer has devoted considerable attention to devising a method whereby the penetrative value of the X rays produced by a focus tube could be easily varied without alteration to the vacuum, and whereby, further, the penetrative value of the rays could be maintained constant at any desired degree, in spite of the uncontrollable variations in the vacuum that are found to occur in practice. A full account of the writer's experience in this direction will be found in a paper, entitled "The Production of X Rays of Different Penetrative Values", recently read at the Royal Society (see page 16); but here it is only necessary to mention that, for any given degree of vacuum, the penetrative value of the rays depends, among other things, upon the area of the cathode disk and upon the lineal distance between the cathode and anti-cathode.

Upon these principles the writer has designed, for practical use, two separate forms of adjustable focus tubes, Figs. 1 and 2 being two views of one of these tubes, and Fig. 3 a view of the other.

In the form of tube shown in Figs. 1 and 2, advantage is taken of the difference of effect produced by employing cathodes of various sizes. As will be seen from the illustration, the tube is provided with four concave aluminum cathodes, C, C', C'', C''', all of the same radius of curvature; namely, 0.75 inch, but of four different diameters, varying from 0.5 of an inch in the case of C, to 1.125 inch in the case of C'''. The cathodes are so placed that they all focus on a point in the center of the bulb of the tube, and the inclined anti-cathode disk B is mounted upon a small steel spindle, turning in aluminum sockets, so that the anti-cathode can be easily rotated by tapping the tube so as to face any one of the four cathodes that it is desired to work with. The anti-cathode disk B made of aluminum and platinum in the manner already described, is an oblique section about 0.25 inch in thickness, cut from an aluminum rod one inch in diameter. The reason for the particular shape of the anti-cathode is to insure its being balanced in all positions of the tube, so that it should have no tendency to rotate of itself.

As will be seen from the illustration, the anti-cathode is supported in a long, double-glass tube, through which passes an aluminum connection to the anode terminal. By this method great rigidity and accuracy are obtained, and the anode and cathode terminals are kept well apart.

During the process of exhaustion it is necessary to make each of the cathodes operative in turn, so as to expel the residual gas, and finally the tube is exhausted to the necessary vacuum to produce X rays of medium penetrative value, when one of the intermediate-sized cathodes is in use. The tube is then sealed off, and afterwards the penetrative value of the rays can be varied at will by turning round the anti-cathode so as to face any one of the cathodes, and making that cathode alone operative. The smallest cathode gives rays of the highest penetration, and the largest cathode rays of the lowest penetration. With cathodes of the dimensions given the range is very considerable. It can be diminished or increased by making the cathodes more nearly of one size, or the reverse. In place of the rotating anti-cathode, a fixed one may be used, consisting of a platinum-faced cone, or preferably of four-sided pyramidical form, with a platinum disk let in on each face opposite to each cathode. The anti-cathode terminal need not be used as an anode, as when one disk is cathode the immediately opposite disk may be employed as an anode.

Mr. Jarvis B. Edson, commodore of the Shelter Island Yacht Club, and a member of the New York Yacht Club, has purchased the fast steam yacht "Claymore", which was built to order for J. Kennedy Tod. She is 80 feet long, about 10 feet beam, and is fitted with a triple-expansion marine engine and Seabury safety water-tube boiler. The yacht will be used by Commodore Edson in the vicinity of Shelter Island, where his Summer home is located.

The following-named out-of-town visitors registered at the office of the National Electric Light Association, New York, last week: Louis O. F. Schaffer, Antwerp, Belgium; E. G. Bernard, Troy, N. Y.; Geo. A. Redman, Rochester, N. Y.; H. B. Cutter, Philadelphia, Pa.; H. B. Jagoe, Tappan, N. Y.; R. T. McDonald, Fort Wayne, Ind.; Ernesto F. De Castro, Nassau, N. P.; R. Xiques, Havana, Cuba.

ADVANCE INFORMATION

Increase of Capital.

PAINESVILLE, OHIO—The Painesville Telephone Company has increased its capital from $10,000 to $20,000.

ST. LOUIS, MO.—The Bell Telephone Company is to increase its capital stock from $400,000 to $1,000,000.

GOSHEN, IND.—The capital stock of the Indiana Electric Railway Company has increased from $25,000 to $110,000.

New Incorporations.

SCRANTON, PA. — The Hubbell Electric Lamp Company has been incorporated, with a capital stock of $35,000.

LA BELLE, MO.—The La Belle Telephone Construction Company has been incorporated by Thomas J. Wright, Claude D. Long, Edward Story and others. Capital stock, $4,000.

NEW YORK, N. Y. — Weiney-Phillips Company has been incorporated to manufacture electrical instruments, with a capital stock of $2,000. The directors are Walter P. Phillips and Albert Suesman, New York; R. H. Weiney, Arlington, N. J.

Business Troubles.

FERGUSON, MO.—G. A. Wurdeman has been appointed receiver of the Olive Branch Electric Light Company.

New Telephone and Telegraph Companies.

MARYVILLE, MO.—The Hanamo Telephone Company has been incorporated by E. H. Ralston, J. C. Donnell, H. E. Ralston and others. Capital stock, $10,000.

GRAHAM, TEX.—The Graham, South Bend & Eliasville Telephone Company has been incorporated by W. L. Donnell, of Eliasville; O. A. McBrayer, W. H. Ardis, R. G. Graham and R. F. Arnold.

BENNETTSVILLE, S. C.—The Bennettsville Telephone Company has been incorporated, with Knox Livingston, president, and Mr. H. H. Newton, Jr., secretary and treasurer.

SAN FRANCISCO, CAL.—The White Telephone Company has completed its line to Bakersfield, and the local lines will soon be completed, connecting the principal parts of the valley.

WARE, MASS.—The New England Telephone Company is constructing a new direct line between this town and Springfield.

SARATOGA SPRINGS, N. Y.—About five miles of the new telephone line between here and Corinth have been completed. This will be an extension of the Hudson River Telephone Company's system.

ONTARIO, N. Y.—The Ontario Telephone Company has been incorporated. The capital stock of the company is $20,000. The directors for the first year are F. A. Emerick, C. H. Bond, Swits Condé, Robert Downey, G. Post, James D. Henderson, James Dowdle, Max B. Richardson, Owen McNally, C. H. Butler and E. Powell.

JANESVILLE, WIS.—The American Telephone and Telegraph Company are making arrangements to continue their line through Rock County. This line is to connect Minneapolis with Chicago.

SACRAMENTO, CAL.—The Pacific Bell Telephone Company is putting up a telephone line from this place to Reno. The line has reached Colfax. It is expected to establish offices at all of the principal towns along the line.

WATERLOO, N. Y.—The Seneca Telephone Company has been incorporated. The proposed line will connect all the towns in the southern part of the county, namely: Farmer, Frontenac, Beach, Sheldrake, Ovid, Romulus, Lodi, Willard, Townsendville and Trumansburg. The amount of capital stock is $4,450.

LOCKPORT, N. Y.—Lockport Telephone Company has been incorporated with a capital of $25,000. The directors are L. J. McParlin, P. H. McParlin, Lockport; William Clark, Fort Plain, and others.

NOBLESVILLE, IND.—The Noblesville Telephone Company has decided to begin the construction of a telephone system connecting the various towns and cities within a radius of 100 miles of that town.

COLUMBIA, TENN.—The Citizens' Telephone Company is erecting a line to Andrews and one to Theta.

SPRINGFIELD, ILL.—The Central Union Telephone Company has in course of construction a metallic-circuit telephone line from this place to Alton.

NORFOLK, VA. — The American Long-Distance Telephone Company has been granted franchise for telephone system.

New Electric Railways.

BALTIMORE, MD.—The Pikesville & Emory Grove Electric Railway and the Falls Road Electric Railway have consolidated, and will enlarge electric power plant of the first-named road, located at Owings Mills, near Baltimore.

SPRINGFIELD, MASS.—A company is being formed to build a new electric railway to connect Springfield and Palmer by trolley, by way of Forest Park, with Chicopee Falls as a terminal.

LONDON, ONT. — The Chatham Electric Railway by-law has passed in satisfactory form, and will be voted on May 20.

MISSISSIPPI CITY, MISS.—S. S. Bullis and others have secured a franchise to build a street railway line between Biloxi and Mississippi City.

MORRISVILLE, PA.—The contract for the construction of the trolley road from this place to Doyleston, by way of Yardley and Newtown, has been awarded by the East Penn Traction Company to Wheeler & Boody, of Philadelphia. This firm will also erect the power house and equip the line with rolling stock.

NORTH EAST, PA.—The project of building an electric road from this place to Lakewood, via Sulphur Springs, Findley's Lake, Sherman and Panama Rocks, is being agitated.

WESTFIELD, N. Y.—The certificate of incorporation of the Westfield, Mayville & Chautauqua Motor Railroad has been filed. The capital stock is $150,000. The directors for the first year are: John C., James V., Waldo L., Haring S., Charles C. and William L. Minton, Harlan W. Gibbs, Willis U. Baldwin and C. R. Cipperly.

Electric Light and Power.

KANSAS CITY, KAN.—The Wyandotte Electric Light Company has been incorporated by J. B. Scroggs, W. T. Atkinson, John Blomquist, John C. Horton and Winfield Freeman. Capital stock, $50,000.

HUNTINGTON, ARK.—City Clerk may be addressed concerning probable establishment of an electric light plant.

PORTLAND, ORE.—A new and improved electric light and power plant is to be established in this city by Henry W. Sprague, electrical engineer.

MARIN, MINN. — Mayor Fred Warneke may be addressed concerning electric light plant.

LAMBERTON, MINN. — Mr. Burmeister's electric light plant is rapidly approaching completion.

FORREST CITY, ARK.—The St. Francis Electric Light Company will erect electric light plant. Contracts have been awarded for machinery.

BAY ST. LOUIS, MISS.—The Mayor may be addressed for information concerning construction of electric light plant and waterworks, for which the city is contemplating the issuance of $40,000 worth of bonds.

NEWTON, N. C.—A. D. Shuford, mayor, may be addressed concerning establishment of electric light plant. Desires bids on cost of erecting same.

CHESTER, S. C. — B. M. Spratt, mayor, may be addressed concerning construction of electric light plant.

MILAN, TENN.—Frank Shefold, engineer, may be addressed concerning construction of electric light plant.

GEORGETOWN, TEX. — The McElroy-Brett Electric Company will establish a new electric light plant.

BAD AXE, MICH.—Bad Axe Electric Light and Power Company has been incorporated, with a capital stock of $10,000.

SIDELL, ILL.—Sidell Electric Light Company, A. R. Orr gave bill of sale two-thirds interest in plant, $1,500; also conveyed two-thirds interest in real estate, $1,500.

JACKSON, MISS.—D. D. Porter, Jr., city clerk, may be addressed concerning lighting of streets with electricity.

HOLLY SPRINGS, MISS.—An electric light plant will be established, and Walter G. Kirkpatrick, of Nashville, Tenn., will prepare plans for same.

ARCADIA, WIS.—Arcadia Electric Light Company, Trempealeau county, has been incorporated; capital, $6,000; incorporators, J. M. Fertig, Charles B. Miller and Frank R. Paine.

LANGDON, N. D. — An electric light plant is to be put in at this place by Paul Gardner, who will have the plant in operation by August 1. Sufficient patronage has already been pledged to guarantee it being a success.

EXETER, ONT.—An electric light plant is to be established here.

PLAINWELL, MICH.—Capitalists of this place are negotiating with the village board for a franchise for an electric lighting plant.

GRACEVILLE, MINN.—The survey for a system of electric lighting for this place has been completed. A plant operating 600 lights will be put in. Both arc and incandescent circuits will be used.

GLENDALE, MASS. — An electric light plant will be erected on the waterfall of the Glendale Mill, which will cost about $20,000.

JEFFERSONVILLE, KY.—The Fort Wayne Electric Light Company has been awarded the contract to put in a plant at the reformatory. The price is $12,325.

LANCASTER, N. Y.—Ernest Feyler has been awarded the contract for furnishing this village with electric lights.

CHICAGO, ILL.—The Cicero Water, Gas and Electric Light Company has been sold to an eastern capitalist.

MUNISING, MICH.—C. F. Smith has been granted a franchise to put in an electric lighting plant in this place. Work on the plant will commence in a short time.

CHICAGO, ILL. — The Standard Automatic Lighting Company has been incorporated; capital stock, $100,000; to deal in lighting materials and oils; incorporators, Charles W. Harper, L. Drake, Lewis M. Williams.

TOLEDO, OHIO—The Northwestern Gas and Electric Company has been incorporated, with a capital stock of $500,000.

MAX MEADOWS, VA.—The Crescent Consolidated Iron Company is erecting an electric light plant.

SOMERVILLE, TENN.—The Mayor may be addressed for information concerning establishment of electric light plant.

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Kindred.... ...Interests

The Okonite Company, New York, are manufacturing a new double conductor telephone wire, covered to match any color of woodwork. This new wire is being made a special feature for interior work by this progressive company, and is one of the neatest and best among their numerous insulating products.

Soldering flux for electrical work has been put on the market in a variety of different shapes. The latest thing in this line is Highland insulating soldering paste, which is being placed upon the market by the Electric Appliance Company, of Chicago. Great claims are made for this paste on account of its convenience and non-corrosive qualities. The Electric Appliance Company are prepared to send small sample boxes of this soldering paste to the trade on application, as they feel confident that its merits will bring business where it has once had a test.

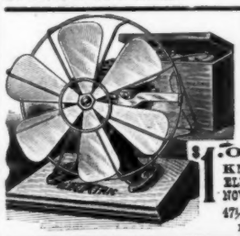
De Veau & Company, of New York, the well known manufacturers of telephone apparatus, received a substantial order last week from Teheran, Persia. The order from this distant point is one of which this company is justly proud, and is a strong testimonial to the fame of their apparatus. The purchasers write that they have an exchange of 24 subscribers, and "inquiries for further development". Also that packages "should be small and well packed for mule transport of 800 miles"! A special instrument is requested for the personal use of the Imperial Minister of Post.

The Berliner decision does not seem to have adversely affected the business of the Western Telephone Construction Company, of Chicago; in fact, that company reports a more favorable business since the decision than it had previous thereto. It reports contracts for seven new telephone exchanges, involving the use of over 2,000 telephones since the decision was published. Some of these contracts are for furnishing apparatus in place of other makes. Among the contracts are 300 for Spartansburg, S. C.; 150 for Florence, Ala.; 300 for a new branch exchange at Fort Wayne, Ind.; 100 for Aledo, Ill.; 200 for Cameron, Mo., and other places which the company does not care to disclose at present. It is asserted by the Western people that their business will show a very large increase in the next three months, and, as an evidence of it, they are putting in a large amount of new machinery and extending their capacity, once more, one-third their present manufacturing ability. They report having received letters from all over the country asking what effect this Berliner patent decision will have, and also report additional orders for increase for nearly all of their present exchanges, which were held awaiting the exact position of the Supreme Court upon this patent.

An Historic Telegram.

[From the Telegraph Age.]

One of the greatest services ever rendered by the telegraph was the transmission from Delhi of the famous telegram of May 11, 1857, which warned the Punjaub of the outbreak of the Indian mutiny. The telegrapher, Brendish, who sent the message has just retired from the service, in receipt of a special pension equal to his salary. Brendish and Pilkington were the two young operators under Mr. Todd, the superintendent of the Delhi telegraph office. On Sunday, May 10, at 4 P. M., it was found that the line from Meerut was interrupted, and Mr. Todd started out to find the break. At the bridge of boats across the Jumna he was met by the mutineers the following morning and murdered. The lads, who were left alone in the office outside the Kashmir gate, saw the mutineers pass, and continued steadily telegraphing to Lahore all the news brought in by peons as to the doings of the mutineers in the city. Brendish went out at noon to see what was going on, but was desired by a wounded British officer to go in and close the doors. There for two hours the two, with the widow and child of Mr. Todd, remained, and at 2 P. M. Brendish went to the Umballa instrument and telegraphed the historic message: "The Sepoys have come in from Meerut and are burning everything. Mr. Todd is dead, and, we hear, several Europeans. We must shut up. And now I am off." The little party then made its way to the flagstaff tower, where the Europeans had congregated, and from there saw the blowing up of the magazine. That night they fled to Umballa. Before they left the tower Pilkington went back to the office to send a message for an officer. Every step of the way was taken in danger of instant death, but the daring mission was accomplished, for the message is recorded as having been received. As the last click died away the mutineers burst in and the signaler was slain. The effect of Brendish's warning message to the Punjaub was that the regiments tainted with mutiny were disarmed before they knew what had taken place at Meerut and Delhi.



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[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED MAY 11, 1897.

582,303 Electric switch; W. J. Newton, New York, N. Y.

582,337 Trolley-wire hanger; J. E. Atwood, Stonington, Ct.

582,344 Support for trolley wires; E. J. Cook, Cleveland, Ohio—A flattened trolley wire, a trolley ear having a chambered groove with projecting lips adapted to be inserted over said flattened surface when turned to an unusual position, and to engage and hold the sides of said wire when turned to the usual or supporting position.

582,378 Carbon for arc lamps; J. D. Smith, Washington, D. C.—Consists of a carbon and a piece of insulating material attached to the carbon and interposed in the path of the arc to extinguish the arc.

582,461 Electrical indicating device; W. W. Dean, St. Louis, Mo.—Consists of an electro magnet with laterally extended pole-pieces provided thereon, a bodily movable armature continuously maintained between said pole-pieces, and a support for said armature adapted to permit the bodily movement thereof to the position approximately of the maximum magnetic intensity of the pole-pieces when the same are energized, whereby a signal is effected.

582,462 Electric circuit terminal; E. N. Dickerson, New York, N. Y.—An electric terminal attached to a circuit wire, the same consisting of a substantially U-shaped, flat portion, one of the arms of the U being provided with a rounded projection.

582,464 Electric contact; C. C. Dusenberry, Lake Mahopac, N. Y.

582,481 Fastening means for core plates of electrical machines; E. E. Nolan, Wilkinsburg, Pa.—Comprises a casting having a cylindrical surface and provided with a circumferential flange at or near one end and a circumferential groove at or near the other end, an annular plate adjacent to said groove, laminæ clamped between the flange and the annular plate, and a fastening ring located partially in said groove and bearing against the outer side of said annular plate.

582,493 Electric meter; G. A. J. Telge, Oldenburg, Germany.—Consists of the pendulum of a clockwork, a coil for the current to be measured and a core for co-operating with said coil, pivotally arranged upright springs, one on each side of the pendulum, and means for transmitting the movements resulting from the action of the coil on its core to said springs.

582,494 Core for electrical machines; G. Westinghouse, Pittsburgh, Pa.

582,513 Telephone transmitter; H. C. Alexander, Bonham, Tex.

582,522 Telephone; C. F. Dunderdale, Chicago, Ill.

582,578 System of electrical intercommunication; E. A. Clark, Sioux City, Iowa.

ISSUED MAY 18, 1897.

582,615 Electric lock; Henry Bezer, New Rochelle, N. Y.—Consists of a locking piece normally held in locking position, means for moving said locking piece out of locking position, said locking piece and said means being both pivoted on the same axis, and independently movable and electrically controlled, means for retaining said locking piece out of locking position.

582,620 Gas engine; J. A. Charter, Beloit, Wis.

582,640 Machine for forming armature coils; G. A. Grisell, Madison, Wis.—Consists of a forming part to receive one side of the coil, another forming part to receive the other side of the coil, two forming parts to receive the ends of the coil, the several parts adjustable, each with reference to the size of its forming aperture, and each separately adjustable with reference to its position relative to the others.

582,649 Electric advertising and display apparatus; J. L. Killmer, New York, N. Y.—Consists of one or more Geissler's tubes bent and arranged to represent symbols or letters, and having a portion of the symbol or letters of a word different in color from the remainder of the symbol or word.

582,663 Electric controller; W. H. Morgan, Alliance, Ohio—Consists of a shell or frame, an annular series of coils therein, said coils arranged in two semi-circular sets, the coils at one end of each set being adapted to offer less resistance than the coils at the other end, contact plates connected to said coils, and a contact or switch arm adapted to be moved over said contact plate, and cut the coils into or out of circuit, two at a time.

582,664 Electric arc lamp; J. A. Mosher, Chicago, Ill.—Consists of an electro-magnet, an armature under its influence, but separated therefrom by a non-magnetic block or substance, and a spring connected with and influencing the armature in the same direction as the magnet, also arranged that when the armature is least influenced by the magnet it is most influenced by the spring.

582,665 Electric arc lamp; J. A. Mosher, Chicago, Ill.

582,694 Electric search light; S. W. Rushmore, Brooklyn, N. Y.

582,698 Electric rail bond; G. H. Scott, Worcester, Mass.

582,714 Telephone toll apparatus; F. M. Archer, New York, N. Y.—Consists of the calling instrument shaft of a telephone, a notched wheel thereon, a bolt adapted to engage the notches of said wheel, an oscillatory key-holder engaging with said bolt, and means whereby a key may oscillate said holder to release the said shaft.

582,721 Electrode; J. A. Deuther, Boston, Mass.

582,772 Method of and apparatus for preventing formation of arcs when opening circuits; T. von Zweigbergk, Cleveland, Ohio—A method of reducing arcing in breaking an electric circuit which consists in establishing a shunt circuit around the contact to be broken, then breaking the main circuit, then gradually commutating the current through the shunt circuit, and finally breaking said shunt circuit.

582,773 Telephony; J. Absterdam, New York, N. Y.

582,840 Electric switch; E. H. Wright, Chicago, Ill.

582,849 Rail bond; F. H. Daniels, Worcester, Mass.

582,862 Circuit-breaker for trolley wires; C. Hoff, Cincinnati, Ohio.

582,882 Trolley for electric railways; S. H. Short, Cleveland, Ohio.

582,884 Brush holder for dynamos; S. H. Short, Cleveland, Ohio.

582,889 Automatic electric gate; J. M. Williams, Danville, Va.

582,901 Receiver for telephones, phonographs, etc.; C. W. Dennis, King's Ferry, N. Y.

Fire Destroys the Ward Leonard Electric Company's Factory.

May 20 the factory of the Ward Leonard Electric Company, at Hoboken, N. J., was completely destroyed by fire. Messrs. Leonard and Mansfield, without delay, secured a vacant factory and arranged to immediately resume the manufacture of their product. They announce that they will promptly execute the orders on file and will be ready for future business with but little delay. The company's temporary address is 120 Washington street, Hoboken.

Contracts for Alley "L" Equipment Let in Chicago.

Some of the largest and most important contracts for electric railway equipments made for some time past were closed in Chicago on the 22d inst., between the South Side Rapid Transit Company and the E. P. Allis Company, the Babcock & Wilcox Company and the Westinghouse Electric and Manufacturing Company. The contracts cover the steam and electric power equipment for operating the Alley "L" by electricity.

The engines will be furnished by the E. P. Allis Company, and consist of four cross-compound condensing engines, each of 1,200 horse-power capacity under conditions of highest possible economy, but capable of developing 2,000 horse-power each if necessary. There will be eight Babcock & Wilcox water-tube boilers with 4,000 square feet of heating surface each, giving a rating of 500 nominal horse-power each. The boilers will have wrought steel headers and will be provided with the Babcock & Wilcox chain grate bars.

The Westinghouse company will furnish four direct-connected generators that, with a pressure of 650 volts at the terminals, will develop 800 kilowatts each.

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

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